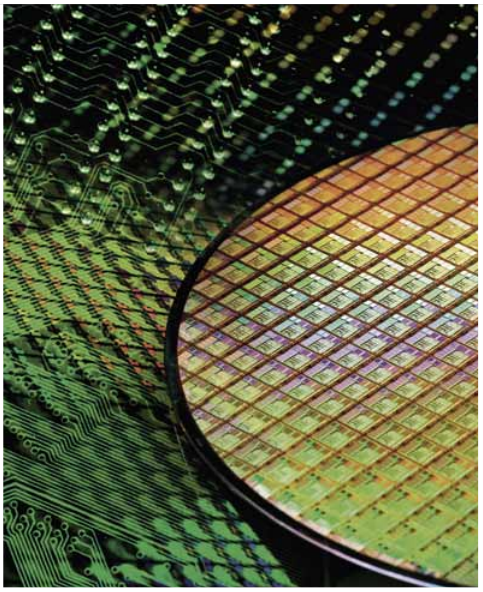
HUMIDITY / DEW POINT / TEMPERATURE /
MOISTURE IN OIL / CARBON DIOXIDE /
PRESSURE / WEATHER



VAISALA

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eXpanding possibilities

Measure and Succeed

Accurate measurements for humidity, temperature, dew point, carbon dioxide, pressure and moisture in oil

If the success of your operations depends on faultless measurements, we have the solution for you: Vaisala HUMICAP®, DRYCAP®, CARBOCAP® and BAROCAP® sensors – the unrivaled industry quality benchmarks.

Only true knowledge matters and only the world's most accurate instruments can deliver it reliably. Based on over 75 years of experience. With unique technologies for long-term stability, proven in the harshest conditions. Vaisala instruments ensure better efficiency, quality, safety and profitability of critical processes in hundreds of applications in dozens of industries worldwide.

Choose from a wide range of fixed and handheld instruments for different applications, requirements and budgets. Tell us how you would like to measure your success. Our sensors will help deliver it.

Online Store

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VAISALA

Demanding measurement requirements across multiple industries, from semiconductor to automotive to power, have always inspired Vaisala to continuously develop measurement instruments that set the benchmark for quality, accuracy, and reliability.

To ensure we continue to understand your needs, we keep a close eye on our customer surveys and on comments collected from the field. I would like to take this opportunity to thank you for your compliments regarding our product performance and technical customer service.
But thank you even more for your comments on how we can improve, including suggestions for new product options and calibration services. For example, customer feedback played a vital role in developing the new GMW90 CO_2 measurement instrument with microglow technology in 2013.

Throughout our over 75-year history, Vaisala has succeeded together with our customers.
Please keep on sharing how we can best address your needs and add value to your investment.
We are here to help you succeed – your success is our success.

Sampsa Lahtinen
Executive Vice President
Controlled Environment
Vaisala

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VAISALA / TECHNOLOGY DESCRIPTION

Vaisala HUMICAP® Sensor for Measuring Relative Humidity

In 1973, Vaisala introduced HUMICAP®, the world's first thin-film capacitive humidity sensor. Since then, Vaisala has become the market leader in relative humidity measurements, and thin-film capacitive humidity sensors have developed from one company's innovation into a global industry standard.

Vaisala HUMICAP sensors guarantee quality and reliability, with their reputation for accuracy, excellent long-term stability, and negligible hysteresis.

How It Works

HUMICAP is a capacitive thin-film polymer sensor consisting of a substrate on which a thin film of polymer is deposited between two conductive electrodes. The sensing surface is coated with a porous metal electrode to protect it from contamination and exposure to condensation. The substrate is typically glass or ceramic.

The thin-film polymer either absorbs or releases water vapor as the relative humidity of the ambient air rises or falls. The dielectric properties of the polymer film depend on the amount of absorbed water. As the relative humidity around the sensor changes, the dielectric properties of the polymer film change, and so does the capacitance of the sensor. The instrument's electronics measure the capacitance of the sensor and convert it into a humidity reading.

Typical Applications for Humidity Measurement

Vaisala's humidity instruments with HUMICAP sensors are suitable for a wide range of applications. From power and steel to life sciences and building automation, many industries need to measure humidity – here are just a few:

Humidity must be measured and controlled in many drying processes, such as those in construction material and paper manufacturing, and fluid bed dryers. The humidity of the process air is a good indicator of the progression of the drying process.

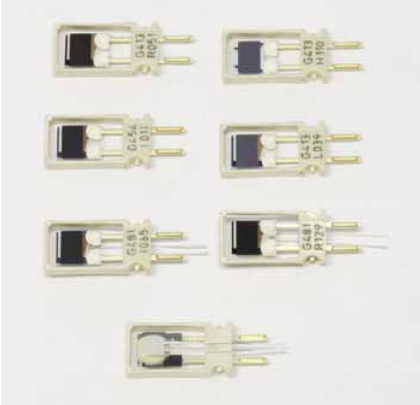
HUMICAP in Brief

- A capacitive thin-film polymer sensor
- Full measurement range 0...100 %RH
- Accurate to ±1 %RH
- Traceable humidity measurement
- Nearly 40 years on the market

HUMICAP's Unique Benefits

- Excellent long-term stability
- Insensitive to dust and most chemicals
- Chemical purge option for stable measurements in environments with high concentrations of chemicals
- Sensor heating for measurements even in condensing environments
- Full recovery from condensation

Cleanrooms and other critical environments also require high-performance environmental measurements in order to operate consistently and within



Family of HUMICAP sensors.

specifications. In addition, glove boxes and isolators – used for handling moisture or gas-sensitive materials – benefit from accurate and reliable humidity measurements. Measuring humidity in a critical environment can be especially challenging.

In the food industry the dryers and ovens used in bread baking and cereal manufacture require a carefully controlled humidity level to maintain consistent quality and high yield, and to give distinctive characteristics to the finished product.

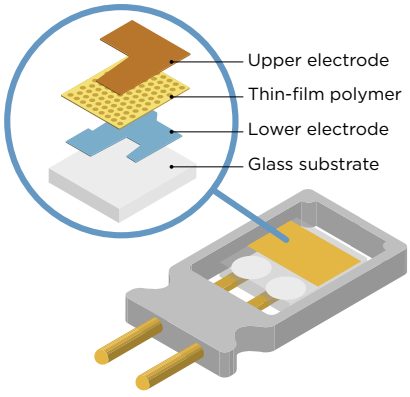
In building automation, optimizing both the temperature and relative humidity of the indoor environment enables a greater level of comfort for occupants than optimizing temperature alone. Careful humidity control is a must in museums, archives, warehouses, and other environments where humidity-sensitive materials are stored.

Vaisala HUMICAP Humidity Products

Vaisala has everything you need for measuring humidity, with a wide range of humidity instruments covering applications from HVAC to the most demanding industrial applications, both indoors and out. Vaisala's humidity instrument offering includes transmitters, modules for volume applications, portable and handheld humidity meters, and humidity calibrators. The full range of humidity products can be found at www.vaisala.com/humidity

Vaisala INTERCAP® Sensor

- Same measurement principle as in the HUMICAP® sensor
- Factory pre-calibrated - no additional calibration or adjustment needed
- Fully interchangeable
- Used in humidity instruments with ±3 %RH accuracy



Structure of the HUMICAP sensor.

HUMICAP® – The Story of Innovation

Until the early 1970s, hair hygrometers were commonly used in radiosondes. At that time, reliable humidity measurement was an unresolved challenge and to solve this, Vaisala began developing a new type of humidity sensor using semiconductors and thin-film materials. The revolutionary HUMICAP humidity sensor was introduced two years later, in 1973, at CIMO VI congress.

HUMICAP was a radical innovation that changed humidity measurements for good. The new technology was groundbreaking: the sensor had no moving parts, and due to the advanced use of semiconductor and thin-film technologies, it was amazingly small. The sensor had a fast response time, good linearity, low hysteresis, and small temperature coefficiency.

Despite the fact that the innovation was designed for a new type of a radiosonde, the greatest interest came from elsewhere: people working in environments as diverse as greenhouses, bakeries, warehouses, construction sites, brick and timber kilns, and museums. The need for reliable humidity measurement was common to all, and instruments that could do this accurately were few and far between.

By 1980, a variety of products based on HUMICAP technology – from hand-held meters to industrial transmitters, calibrators, and other accessories – were being sold in over 60 countries. Since its birth, HUMICAP has been part of Vaisala's core business, propelling the company to industry leadership in the field of humidity measurement.

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VAISALA

How to Choose the Right Instrument for Measuring Humidity and Dew Point

Learn the basics and get the best out of your humidity measurements.

Humidity measurement and control is called for in a wide variety of industrial applications. Each application has a different set of requirements for humidity instruments, such as required measurement range, tolerance to extreme temperature and pressure conditions, ability to recover from condensation, ability to operate in hazardous environments, and options for installation and calibration. There is no single device that is suitable for all needs. In fact, the range of available equipment is quite large, varying both in cost and quality.

This paper discusses the following topics in order to help in selecting the right humidity instrument:

- Different humidity parameters
- Environmental conditions that influence the choice of humidity instrument
- Sensor properties that influence the choice of humidity instrument
- Practical guidelines for selecting a humidity instrument

What is Humidity? An Introduction to Humidity Parameters

Partial Pressure of Water Vapor

Humidity is simply water in its gaseous phase, properly called water vapor. Because water vapor is a gas, most of the common gas laws apply to it, including Dalton's law of partial pressures. Dalton's law says that the total pressure of a gas is equal to the sum of the partial pressures of each of the component gases:

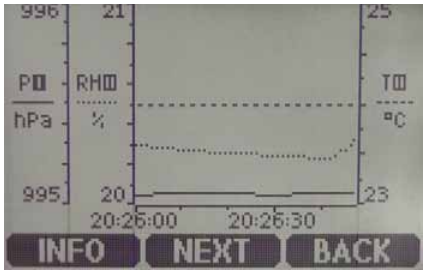
$$P_{total} = P_1 + P_2 + P_{3...}$$

If we consider air, the equation means that the total atmospheric pressure of 1.013 bar (14.7psia) is the sum of the partial pressures of nitrogen, oxygen, water vapor, argon, carbon dioxide, and various other gases in trace amounts.

Definition of Water Vapor Pressure

Water vapor pressure (P_w) is the pressure exerted by the water vapor present in air or a gas. Temperature dictates the maximum partial pressure of water vapor. This maximum pressure is known as saturation vapor pressure (P_{ws}). The higher the temperature, the higher the saturation vapor pressure and the more water vapor the air can hold. Thus, warm air has a greater capacity for water vapor than cold air.

If saturation vapor pressure is reached in air or in a gas mixture, the introduction of additional water vapor requires that an equal amount condenses out of the gas as a liquid or a solid. A psychrometric chart shows graphically the relation between saturation vapor pressure and temperature. In addition, vapor pressure tables can be used to see the saturation vapor pressure at any temperature, and there are also a number of computer-based calculation programs available.



Some humidity measurement instruments allow an individual humidity parameter to be chosen which can then be followed on a graphical display. This picture shows different views of the Vaisala HUMICAP Hand-Held Humidity and Temperature Meter HM70 display.

Effect of Pressure on Humidity

Dalton's law states that a change in the total pressure of a gas must have an effect on the partial pressures of all of the component gases, including water vapor. If, for example, the total pressure is doubled, the partial pressures of all component gases are doubled as well. In air compressors, a pressure increase "squeezes" water out of the air as it is compressed.

Humidity calculators are also available for mobile phones.

This happens because the partial pressure of water vapor (P_w) is increased, but the saturation vapor pressure is still only a function of temperature. As pressure builds in a receiver tank and P_w reaches P_{ws}, water condenses into liquid and must ultimately be drained from the tank.

Relative Humidity

When thinking conceptually of water vapor as a gas, it's easy to define relative humidity. Relative humidity (RH) can be defined as the ratio of the partial water vapor pressure (P_w) to the water vapor saturation pressure (P_{ws}) at a particular temperature:

$$\%RH = 100\% \times P_w / P_{ws}$$

Relative humidity is strongly temperature dependent as the denominator in the definition (P_{ws}) is a function of temperature. For example, in a room with an RH of 50% and a temperature of 20°C, increasing the temperature of the room to 25°C will decrease the RH to about 37%, even though the partial pressure of the water vapor remains the same.

Pressure will also change relative humidity. For example, if a process is kept at a constant temperature, relative humidity will increase by a factor of two if the process pressure is doubled.

Dew Point Temperature

If a gas is cooled and gaseous water vapor begins to condense in the liquid phase, the temperature at which condensation occurs is defined as the dew point temperature (T_d). At 100%RH the ambient temperature equals the dew point temperature. The further negative the dew point is from the ambient temperature, the smaller the risk for condensation and the drier the air.

Dew point directly correlates with saturation vapor pressure (P_{ws}). The partial pressure of water vapor associated with any dew point can be easily calculated. Unlike RH, dew point is not temperature dependent but it is affected by pressure. Typical applications for dew point measurement include various drying processes, dry air applications, and compressed air drying.

Frost Point Temperature

If the dew point temperature is below freezing – which is the case in dry gas applications – the term frost point (T_f) is sometimes used to explicitly state that the condensing phase is ice. The frost point is always slightly higher than the dew point below 0°C as the water vapor saturation pressure of ice is different to water. People also often refer to dew point for subzero values, even though they mean frost point. Ask for clarification if you are not certain.

Parts Per Million

Unit parts per million (ppm) is sometimes used for low levels of humidity. It is the ratio of water vapor to dry gas or total (moist) gas, and is expressed either by volume/volume (ppm_{vol}) or mass/weight (ppm_w). Parts per million (ppm_{vol}) can be quantitatively expressed as follows:

$$ppm_{vol} = [P_w /(P - P_{ws})] \times 10^6$$

The ppm parameter is typically used when defining the water vapor content of pressurized and dry pure gases.

Mixing Ratio

The mixing ratio (x) is the ratio of water vapor mass to the mass of dry gas. It is dimensionless but often expressed in grams per kilogram of dry air. The mixing ratio is mainly used in drying processes and HVAC applications for calculating water content when the mass flow of air is known.

Wet Bulb Temperature

Traditionally, the wet bulb temperature (T_w) is the temperature indicated by a thermometer wrapped in a wet cotton sheath. The wet bulb and ambient temperatures can be used together to calculate relative humidity or dew point. For example, the wet bulb temperature is used in air conditioning applications where it is compared to the dry bulb temperature to determine the cooling capacity of evaporative coolers.

Absolute Humidity

Absolute humidity (a) refers to the mass of water in a unit volume of moist air at a given temperature and pressure. It is usually expressed as grams per cubic meter of air. Absolute humidity is a typical parameter in process control and drying applications.

Water Activity

Water activity (aw) is similar to equilibrium relative humidity and uses a scale of 0 to 1, instead of 0% to 100%.

Enthalpy

Enthalpy is the amount of energy required to bring a gas to its current state from a dry gas at 0°C. It is used in air conditioning calculations.

The Effect of Environmental Conditions on Humidity Measurement

Environmental conditions can have a significant effect on humidity and dew point measurements. Take the following environmental factors into consideration to achieve the best possible measurement result:

Select a Representative Measurement Location

Always choose a measuring point that is representative of the environment being measured, avoiding any hot or cold spots. A transmitter mounted near a door, humidifier, heat source, or air conditioning inlet will be subject to rapid humidity changes and may appear unstable.

As relative humidity is strongly temperature dependent, it is very important that the humidity sensor is at the same temperature as the measured air or gas. When comparing the humidity readings of two different instruments, the thermal equilibrium between the units/probes and the measured gas is particularly crucial.

Unlike relative humidity, dew point measurement is independent of temperature. However, when measuring dew point, pressure conditions must be taken into account.

Beware of Temperature Differences

When mounting a humidity probe into a process, avoid temperature drops along the probe body. When there is a large temperature difference between the probe and the external environment, the whole probe should be mounted within the process and the cable entry point should be insulated.

When there is a risk of condensation, the probe should be mounted horizontally to avoid water dripping down the probe/cable and saturating the filter (see figure 1).

Ensure that air is allowed to flow around the sensor. Free air flow ensures that the sensor is in equilibrium with the process temperature. At 20°C and 50%RH, 1°C difference between the sensor and the measurement zone will cause an error of 3%RH. At 100%RH the error is 6%RH (see figure 2).

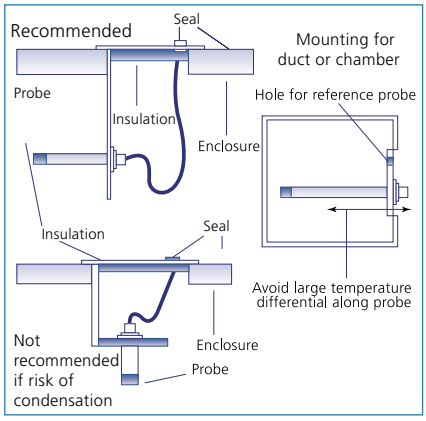


Figure 1: *Mounting a humidity probe in a condensing environment.*

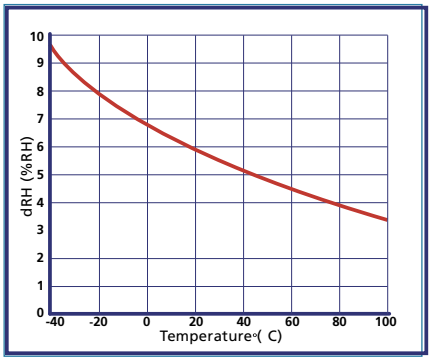


Figure 2: *Measurement error at 100%RH at various temperatures when the temperature difference between the ambient air and the sensor is 1°C.*

The Right Instrument for High Humidity

Environments with >90%RH are defined here as high humidity environments. At 90%RH a difference of 2°C can cause water to condense on the sensor, which in an unventilated space may take hours to dry. Vaisala humidity sensors will recover from condensation. However, if the condensed water is contaminated, the instrument accuracy can be affected due to deposits on the sensor, especially salt deposits. Even the life of the sensor may be shortened. In applications with high humidity where condensation can occur, a warmed sensor head probe such as the Vaisala HUMICAP® Humidity and Temperature Transmitter HMT337 should be used.

The Right Instrument for Low Humidity

Environments with <10%RH are defined here as low humidity environments. At low humidities, the calibration accuracy of instruments measuring relative humidity may not be adequate. Instead, measuring dew point will provide a good indication of humidity. For example, Vaisala DRYCAP® products are designed for measuring dew point.

If a dryer fails in a compressed air system, water condensation may appear and the instrument will need to recover. Many dew point sensors are damaged or destroyed in such situations, but Vaisala DRYCAP® dew point sensors withstand high humidity – and even water spikes.

The Right Instrument for Extreme Temperature and Pressure Conditions

Continuous exposure to extreme temperatures may affect sensor and probe materials over time. It is therefore very important to select a suitable product for demanding environments. In temperatures above 60°C the transmitter electronics should be mounted outside the process and only a suitable high temperature probe should be inserted into the high temperature environment. Moreover, built-in temperature compensation is required to minimize the errors caused by large temperature swings or operation at temperature extremes.

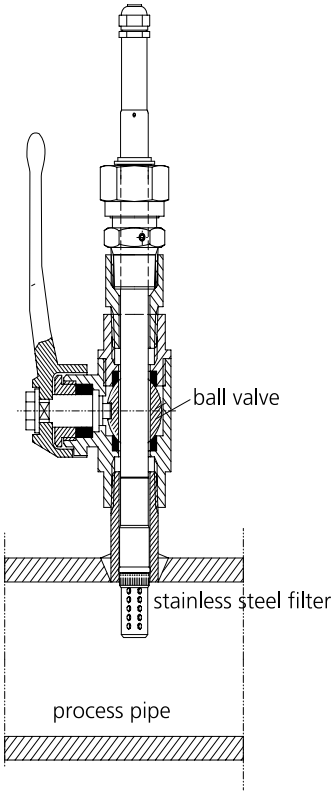


Figure 3: *A ball valve installation in a process pipe line.*

When measuring humidity in processes operating at around ambient pressure, a small leak may be tolerable and can be reduced by sealing around the probe or cable. However, when the process needs to be isolated, or when there is a large pressure difference between the process and the external environment, a sealed probe head with appropriate mounting must be used. Pressure leaks at the point of entry will alter the local humidity and result in false readings.

In many applications it is advisable to isolate the probe from the process with a ball valve to enable the removal of the probe for maintenance without shutting down the process (see figure 3).

When is a Sampling System Needed for Dew Point Measurement?

Wherever possible, the probe should be mounted in the actual process to achieve the most accurate measurements and a rapid response time. However, direct installations are not always feasible. In such situations, sample cells installed in-line provide an entry point for a suitable measurement probe.

Note that external sampling systems should not be used to measure relative humidity because the change in temperature will affect the measurement. Sampling systems can instead be used with dew point probes. When measuring dew point, sampling systems are typically used to lower the temperature of the process gas, to protect the probe against particulate contamination, or to enable easy connection and disconnection of the instrument without ramping down the process.

The simplest dew point sampling setup consists of a dew point transmitter connected to a sampling cell. Vaisala has several models suitable for the most common applications and sampling needs. For example, the easy to install DSC74 sampling cell is designed for the flow and pressure conditions in compressed air applications.

In demanding process conditions, sampling systems must be designed carefully. As dew point is pressure dependent, a flow meter, pressure gauge, special non-porous tubing, filters, and pump may be needed. As an example, a flow chart showing the Vaisala DRYCAP® Portable Sampling System DSS70A for DM70 is shown in figure 4.

In a pressurized system a sample pump isn't needed as the process pressure induces a large enough flow to the sampling cell.

When measuring dew point with a sampling system, trace heating should be used when the ambient temperature around the cooling coil or connecting tube is within 10°C of the dew point temperature. This prevents condensation in the tubing that connects the dew point instrument to the process.

Hazardous Environments

Only products with appropriate certification can be used in potentially explosive areas. For example, in Europe products must comply with the ATEX100a directive, which has been mandatory since 2003. Intrinsically safe products are designed in such a manner that even in the event of failure they do not generate enough energy to ignite certain classes of gas. The wiring from the intrinsically safe product into the safe area must be isolated via a safety barrier. For example, the Vaisala HMT360 series of intrinsically safe humidity transmitters are specially designed for use in hazardous environments.

Vaisala HUMICAP® Humidity and Temperature Transmitter Series HMT360 is designed for hazardous and explosive environments.

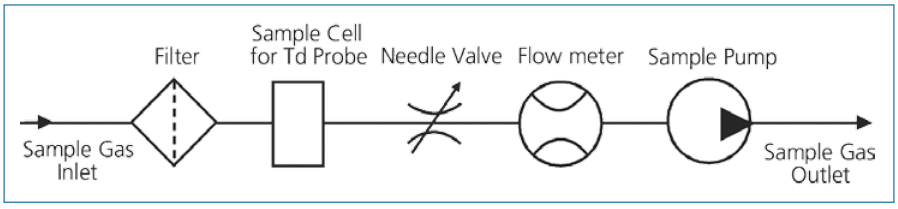


Figure 4: *The DSS70A sampling system includes a filter to clean the gas and a needle valve to control the sample flow rate. A sample pump is needed to generate flow from an unpressurized process gas.*

Shock and Vibration

When the probe will be subject to excessive shock or vibration, the choice of probe, mounting method, and installation location needs careful consideration.

What Makes a Good Humidity Sensor?

Humidity sensor performance is a critical contributor to the overall quality of the humidity measurement. Consider the importance of the following sensor properties:

Fast Response Time

The sensor response time is the speed of response when the sensor is subjected to a step change in humidity. In addition to the sensor, factors such as temperature, airflow, and filter type all have an effect on response time. A blocked filter will give a slower response.

Optimal Measurement Range

The choice of humidity sensor depends on the application and operating temperature, especially at the extremes of humidity.

The majority of Vaisala's humidity sensors work over the full range from 0 to 100%RH. Vaisala HUMICAP® sensors are the optimal choice for applications with a relative humidity around 10–100%RH, whereas DRYCAP® sensors are designed for measurements in low humidities around 0–10%RH.

Good Chemical Tolerance

Aggressive chemicals can damage or contaminate sensors. The instrument manufacturer should know the effects of various chemicals on their sensors and be able to give advice related to acceptable chemical concentrations.

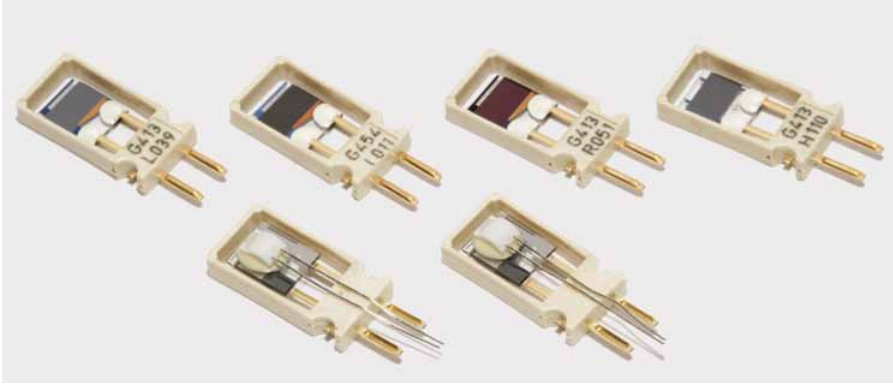
High Accuracy

Accuracy as a term is well established, but difficult to define. Each step in the calibration chain – from the primary standard in an internationally recognized calibration laboratory, to the actual product

manufacture and the measurement on site – introduces measurement error. The sum of these potential errors is the uncertainty of the measurement.

When selecting a humidity sensor, consider the following factors associated with accuracy:

- Linearity over the working range
- Hysteresis and repeatability
- Stability over a period of time
- Temperature dependence of the sensor



Humidity sensors from Vaisala.

During manufacture, Vaisala products are compared and adjusted against factory standards that are directly traceable to internationally recognized standards. The calibration chain is detailed in the certificates that are supplied with the majority of Vaisala products.

The Right Humidity Instrument for the Job

Protective filters for Vaisala's humidity instruments.

No matter what the application, the total range of gas temperatures and expected water vapor levels must be known in order to decide the optimal humidity parameters and the optimal instrument for the environment. The process pressure must also be known when measuring humidity within the process. In addition, it must be decided whether to make the measurement at the process pressure or at some other pressure. For gases other than air, the gas composition must be known.

The terms probe, transmitter, and sensor describe products that measure humidity. The probe is the part of the product that contains the humidity sensor. The probe may be rigidly bound to the transmitter or connected with a flexible cable. The transmitter provides the output signal.

Vaisala designs and manufactures a range of products for measuring relative humidity, temperature, and dew point based on HUMICAP® and DRYCAP® sensors. All Vaisala humidity instruments feature built-in temperature compensation to minimize the errors caused by temperature variations and operation at extremes of temperature. Many of the products include built-in calculations for other humidity parameters.

Protect the Sensor and Electronics with the Right Filter

As well as screening the sensor from any stray electromagnetic fields, the filter protects the sensor from dust, dirt, and mechanical stress. A membrane or netting filter is a good alternative for the majority of applications. In temperatures above 80°C, in high pressure, or in rapidly moving air up to 75 m/sec, a sintered filter should be used.

A suitable protective enclosure protects the instrument electronics from dust, dirt, and excessive humidity. An enclosure with an IP65 or NEMA 4 classification gives good protection against dust and sprayed water. The cable entry points need to be sealed during installation.

When using the instrument outside, it should be mounted in a radiation shield or Stevenson screen to prevent solar radiation or extremes of weather from affecting the measurement.

Must the Instrument Tolerate Condensation?

Making good quality humidity measurements in near-condensing conditions is very challenging. Warmed probe technology ensures reliable measurements when measuring relative humidity close to saturation point. The humidity level of the warmed probe always stays below the ambient level, where condensation occurs.

Must the Instrument Withstand Exposure to Chemicals?

A chemical purge feature helps to maintain measurement accuracy in environments with a high concentration of chemicals or

cleaning agents. The chemical purge heats the sensor at regular intervals to remove chemicals that may have accumulated over time.

The Importance of Electromagnetic Compatibility (EMC)

There are many standards defining the ability of products to withstand external electrical interference. In addition, the product must not generate emissions that can cause interference to sensitive equipment. Industrial applications have more demanding EMC requirements than HVAC installations – the CE marking used in Europe guarantees compliance.

Consider Wiring and Earthing

Except for short cable runs, a screened cable is recommended. Proximity to high-voltage cables or RF sources should be avoided. It is good practice to earth the connection cable screen at a common point and avoid multiple earth points. Galvanic isolation is also available on some Vaisala products.

Vaisala HUMICAP® Humidity and Temperature Transmitter Series HMT330 is a flexible product family designed for demanding industrial applications.

Which Power Supply and Output Signals are Needed?

The majority of measurement instruments are powered using a low voltage supply. If a low voltage AC supply is used, an isolated supply is recommended for each transmitter to avoid earth loops or interference from an inductive load.

Analog output instruments usually have an option for both voltage and current outputs. The choice depends on the length of the signal path and on the interfacing equipment. Some products have a 4–20mA loop power connection, which is a 2-wire system where the output signal current is measured in the supply line.

In addition to analog outputs, some Vaisala products feature digital communication via RS-232, RS-485, or LAN/WLAN interfaces. Selected commercial protocols (Modbus, BACnet) are also available.

Consider Calibration before Purchasing

Instruments typically need to be calibrated every year or every second year. Calibration requirements depend on the application and the stability of the instrument, with wide variations in how easy it is to carry out field checking and calibration. Some instruments need to be sent to a laboratory for calibration, for example. Understanding the calibration needs is therefore an important part of instrument selection.

Calibration Frequency

An individual calibration certificate for a particular instrument indicates the accuracy and linearity at the time of calibration. However, it does not reflect the stability of the instrument in the long run. Calibration at routine intervals is essential to understand the instrument's long-term stability.

Calibration frequency depends on the operating environment. A rule of thumb for Vaisala instruments is that yearly calibration is enough for HUMICAP® products, whereas in most applications a two-year calibration interval is suitable for DRYCAP® products. When measuring in constant high humidity (>85%RH), high temperature (>120°C), or chemically aggressive atmospheres, more frequent checks may be needed.

On-site calibration of a HMW90 humidity transmitter with a HM70 hand-held meter.

Humidity Instrument Calibration

In calibration, the humidity reading of an instrument is compared against a portable reference. The reference should be regularly calibrated and provided with a valid certificate. When selecting one of the many calibration methods, time, cost, technical requirements, expertise, and the unique needs of the organization must be balanced.

Portable meters and products that can be removed from the installation can be calibrated in an approved laboratory or returned to the instrument provider for calibration. Vaisala has four Service Centers around the world available for calibration.

Instruments installed in processes that operate within narrow boundaries can be calibrated using on-site one-point calibration that can be performed without disconnecting the instrument. One-point calibration can also be used to identify the need for further calibration and adjustment.

Some portables such as the Vaisala HUMICAP® Hand-Held Humidity and Temperature Meter HM70 or the Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70 can be directly connected to the installed product and the readings compared to those on the portable meter's display.

In environments with large variations in humidity, multi-point calibration is recommended. Two-point or three-point calibrations can be accomplished in the field with the help of humidity-generating equipment, as long as the local environment is at a stable temperature. The advantage of multi-point calibration compared to one-point calibration is higher accuracy over the entire measurement range. Multiple humidity levels can be created with the Vaisala Humidity Calibrator HMK15, for example.

Vaisala Humidity Calibrator HMK15 for multi-point on-site calibrations.

Calibration of Dew Point Instruments

It is a demanding task to perform high-quality calibrations on low dew point instruments. For this reason, Vaisala doesn't recommend customers perform calibrations on Vaisala DRYCAP® products. Instead, they should be calibrated in professional calibration laboratories, such as Vaisala Service Centers. However, it is possible to perform a field check on a dew point instrument to identify whether adjustment is needed, using the Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70.

To learn more about Vaisala's humidity instruments, visit www.vaisala.com/humidity.

VAISALA

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HMT330 Series Humidity and Temperature Transmitters for Demanding Humidity Measurement

The HMT330 transmitter family offers reliable performance for a wide variety of demanding industrial humidity measurements.

Features/Benefits

- Six models for demanding industrial applications
- Full 0 ... 100 %RH measurement, temperature range up to +180 °C (+356 °F) depending on model
- Pressure tolerance up to 100 bar depending on model
- 4th generation Vaisala HUMICAP® sensor for superior accuracy and stability
- Graphical display and keypad for convenient operation
- Multilingual user interface
- Excellent performance in harsh conditions; good chemical tolerance
- Corrosion-resistant IP65/IP66 housing
- NIST traceable calibration (certificate included)
- Analog outputs, RS232/485, WLAN/LAN
- MODBUS protocol support (RTU/TCP)
- Compatible with Vaisala viewLinc software

The Vaisala HUMICAP® Humidity and Temperature Transmitter Series HMT330 is designed for demanding industrial applications where stable measurements and extensive customization are essential. With multiple options to choose from, the instrument can be tailored to meet the specific needs of each individual application.

Proven Vaisala HUMICAP® Performance

The HMT330 series incorporates Vaisala's 40 years of experience in industrial humidity measurement. The updated fourth-generation HUMICAP sensor provides accurate and stable measurement even in environments with high humidity or chemical contaminants.

Chemical Purge Minimizes Effects of Contaminants

In environments with high concentrations of chemicals and cleaning agents, the chemical purge option helps to maintain measurement accuracy between calibration intervals.

The chemical purge involves heating the sensor to remove harmful chemicals. The function can be initiated manually or programmed to occur at set intervals.

Wide Range of Installation Options

The wide variety of measurement probes, several installation accessories, and universal mains and DC power options make the instruments easy to install in various locations and kinds of environment; walls, poles, pipelines, and ducts, for example. The input/output cable can be fed through the back of the transmitter, which is a useful feature, especially for cleanroom installations.

The HMT330 series includes six models:

- HMT331 for wall-mounted applications
- HMT333 for ducts and tight spaces
- HMT334 for high-pressure and vacuum applications
- HMT335 for high-temperature applications
- HMT337 for high-humidity applications
- HMT338 for pressurized pipelines

Graphical Display of Measurement Data and Trends for Convenient Operation

The HMT330 series features a large numerical and graphical display with a multilingual menu and keypad. It allows users to easily monitor operational data, measurement trends, and access measurement history for the past 12 months.

The optional data logger, with real-time clock, makes it possible to generate over four years of measurement history, and zoom in on any desired time or time frame.

The display alarm allows any measured parameter to be tracked, with freely configurable low and high limits.

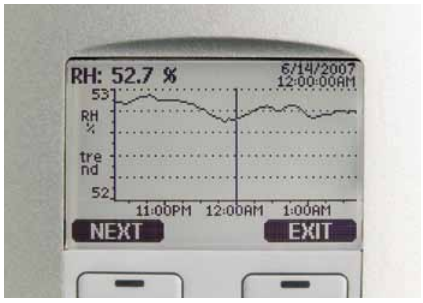
Versatile Outputs and Data Collection

The HMT330 can support up to three analog outputs; an isolated galvanic power supply and relay outputs are also available.

For serial interface the USB connection, RS232, and RS485 can be used.

HMT330 is also capable of applying the MODBUS communication protocol and, together with an appropriate connection option, provides either MODBUS RTU (RS485) or MODBUS TCP/IP (Ethernet) communication.

The data logger, with real-time clock and battery backup, guarantees reliable logging of measurement data for over four years. The recorded data can be viewed on the local display or transferred to a PC with Microsoft Windows® software. The transmitter can also be connected to a network with an optional (W)LAN interface, which enables a (wireless) Ethernet connection. A USB service cable makes it easy to connect the HMT330 to a PC via the service port.



The display shows measurement trends and over four years of real-time measurement history.

Flexible Calibration

The HMT330 instruments are calibrated at six humidity points at the factory and come with a calibration certificate that meets all the relevant traceability and compliance requirements.

A quick, one-point field calibration can be performed with the hand-held HM70 meter. A two-point field calibration can be performed, for example, with the HMK15 salt bath calibrator in a controlled environment. The transmitter can also be sent to Vaisala for recalibration, and accredited calibrations are available.

Technical Data

Performance

RELATIVE HUMIDITY

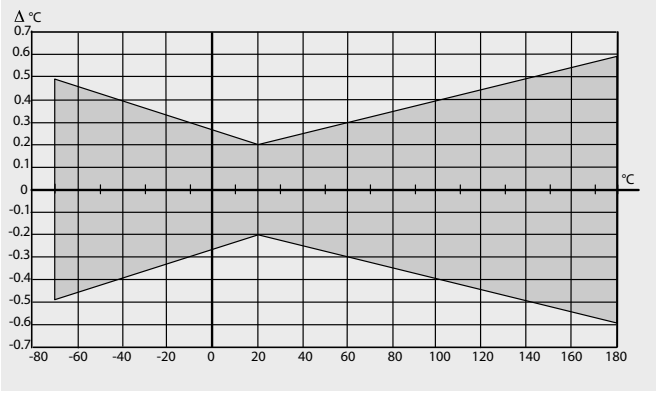
Measurement range	0 ... 100 %RH
Accuracy (including non-linearity, hysteresis, and repeatability)	
with Vaisala HUMICAP® 180 or 180R*	for typical applications
with Vaisala HUMICAP® 180C or 180RC*	for applications with chemical purge/warmed probe
at +15 ... +25 °C (59 ... +77 °F)	±1 %RH (0 ... 90 %) ±1.7 %RH (90 ... 100 %RH)
at -20 ... +40 °C (-4 ... +104 °F)	±(1.0 + 0.008 x reading) %RH
at -40 ... +180 °C (-40 ... +356 °F)	±(1.5 + 0.015 x reading) %RH
Factory calibration uncertainty (+20 °C)	±0.6 %RH (0 ... 40 %RH) ±1.0 %RH (40 ... 97 %RH)
	(Defined as ±2 standard deviation limits. Small variations possible; see also calibration certificate.)
Response time (90%) at +20 °C (+68 °F)	8 s/17 s** with grid filter
in still air	20 s/50 s** with grid + steel netting filter
	40 s/60 s** with sintered filter

*HUMICAP 180R or 180RC recommended

**with HUMICAP 180R or 180RC sensor

TEMPERATURE

Accuracy at +20 °C (+68 °F)	± 0.2 °C (± 0.36 °F)
Accuracy over temperature range (measurement range depends on model)	



Temperature sensor	Pt100 RTD Class F0.1 IEC 60751

Other available variables (model-dependent)

dew point temperature, mixing ratio, absolute humidity, wet bulb temperature, enthalpy, water vapor pressure

Inputs and Outputs

Operating voltage	10 ... 35 VDC, 24 VAC ±20%
with optional power supply module	100 ... 240 VAC, 50/60 HZ
Power consumption at +20 °C (U_{in} 24 VDC)	
RS232	max. 25 mA
U_{out} 2 x 0 ... 1 V/0 ... 5 V/0 ... 10 V	max. 25 mA
I_{out} 2 x 0 ... 20 mA	max. 60 mA
display and backlight	+ 20 mA
during chemical purge	max. 110 mA
during probe heating (HMT337)	+ 120 mA
Analog outputs (2 standard, 3rd optional)	
current output	0 ... 20 mA, 4 ... 20 mA
voltage output	0... 1 V, 0... 5 V, 0... 10 V
Accuracy of analog outputs at +20 °C	±0.05% full scale
Temperature dependence of the analog outputs	±0.005%/°C full scale
External loads	
current outputs	R_L < 500 ohm
0 ... 1 V output	R_L > 2 kohm
0 ... 5 V and 0 ... 10 V outputs	R_L > 10 kohm
Max. wire size	0.5 mm^2 (AWG 20)
	stranded wires recommended
Digital outputs	RS232, RS485 (optional)
Protocols	ASCII commands, MODBUS RTU
Service connection	RS232, USB
Relay outputs (optional)	0.5 A, 250 VAC
Ethernet interface (optional)	
Supported standards	10BASE-T, 100BASE-TX
Connector	8P8C (RJ45)
IPv4 address assignment	DHCP (automatic), static
Protocols	Telnet, MODBUS TCP/IP
WLAN interface (optional)	
Supported standards	802.11b
Antenna connector type	RP-SMA
IPv4 address assignment	DHCP (automatic), static
Protocols	Telnet, MODBUS TCP/IP
Security	WEP 64/128, WPA2/802.11i
Authentication / Encryption (WLAN)	
Open / no encryption	
Open / WEP	
WPA Pre-shared key / TKIP	
WPA Pre-shared key / CCMP (a.k.a. WPA2)	
Optional data logger with real-time clock	
Logged parameters	max. four with trend/min/max values
Logging interval	10 sec. (fixed)
Max. logging period	4 years, 5 months
Logged points	13.7 million points per parameter
Battery lifetime	min. 5 years
Display	LCD with backlight, graphical trend display of any parameter
Menu languages	English, Chinese, Finnish, French, German, Japanese, Russian, Spanish, Swedish

Mechanics

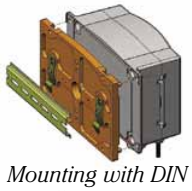
Cable bushing	M20 x 1.5 for cable diameter 8 ... 11 mm/0.31 ... 0.43"
Conduit fitting	1/2" NPT
User cable connector (optional)	M12 series 8-pin (male)
option 1	female plug with 5 m (16.4 ft.) black cable
option 2	female plug with screw terminals
Probe cable diameter	
HMT333 (+80 °C)	6.0 mm
other probes	5.5 mm
Standard probe cable lengths	2 m, 5 m or 10 m (Additional lengths available, please see order forms for details)
Housing material	G-AlSi 10 Mg (DIN1725)
Housing classification	IP 66 IP65 (NEMA4X) with local display
Weight depending on selected probe, cable and modules	1.0 - 3.0 kgs

Operating Environment

Operating temperature	
for probe	same as measurement range
for transmitter body	-40 ... +60 °C (-40 ... 140 °F)
with display	0 ... +60 °C (32 ... 140 °F)
Electromagnetic compatibility	Complies with EMC standard EN61326-1, Industrial Environment
	Note: Transmitter with display test impedance of 40 ohm is used in IEC61000-4-5 (Surge immunity)

Mounting Options

*Mounting with Wall Mounting Kit**



Mounting with DIN Rail Installation Kit

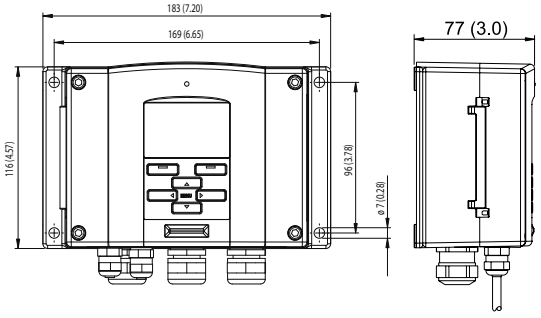
Pole Installation with Installation Kit for Pole or Pipeline

Mounting Rain Shield with Installation Kit

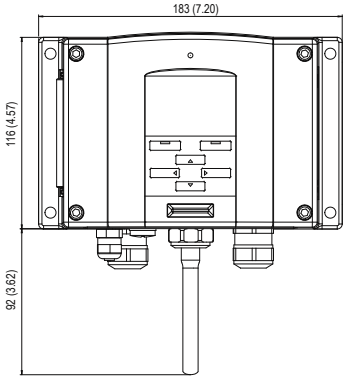
*not mandatory for wall installations

Dimensions

Dimensions in mm (inches)



Transmitter with WLAN antenna



TYPE APPROVED PRODUCT
CERTIFICATE NO.: A-13529

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HMT331 Humidity and Temperature Transmitter for Demanding Wall-Mounted Applications

The HMT331 is a state-of-the-art wall-mounted humidity measurement instrument.

The Vaisala HUMICAP® Humidity and Temperature Transmitter HMT331 is a high-quality wall-mounted transmitter for demanding HVAC and condition-monitoring applications.

Typical Applications

- cleanrooms
- pharmaceutical processes
- swimming halls
- museums and archives

HMT331 Humidity and Temperature Transmitter with short flexible probe and optional WLAN.

Technical Data

Temperature measurement range	-40 ... +60 °C (-40 ... +140 °F)

Accessories

USB service port cable with PC software	219916
Connection cable for HM70	211339
Wall-mounting plate (plastic)	214829
Pole installation kit with rain shield	215109
DIN rail installation set	215094
PPS plastic grid filter with stainless steel net	DRW010281SP
Stainless steel sintered filter	HM47280SP

HMT333 Humidity and Temperature Transmitter for Ducts and Tight Spaces

The Vaisala HUMICAP® Humidity and Temperature Transmitter HMT333 is a versatile instrument for applications where a small remote probe is needed, for example in demanding HVAC applications. Its small thermal mass enables rapid response to temperature changes.

The HMT333 transmitter's compact probe is designed for remote applications.

Flexible Installation

To install the probe in ducts, channels, and through walls, an installation kit is available with a stainless steel flange, lead-through piece, and steel support bar.

The HMT333 has two probe cable options – a flexible rubber cable that withstands temperatures of up to +80 °C, and a durable cable that withstands temperatures of up to +120 °C. Both cable options are available in lengths of 2, 5, and 10 meters. Additionally, flexible rubber cable (+80 °C) is available in 20-meter lengths.

For outdoor environments, the DTR502B solar radiation shield provides protection for the probe. The shield can be installed on a pole, beam, or flat surface.

Typical Applications

- cleanrooms
- pharmaceutical processes
- environmental chambers
- processes with moderate temperature and humidity

Duct installation kit for HMT333 and HMT337.

Technical Data

Temperature measurement range	-40 ... +80 °C (-40 ... +176 °F) or -40 ... +120 °C (-40 ... +248 °F)

Accessories

Duct installation kit	210697
Cable gland with split seal	HMP247CG
USB service port cable with PC software	219916
Connection cable for HM70	211339
Wall-mounting plate (plastic)	214829
Pole installation kit with rain shield	215109
Solar radiation shield	DTR502B
DIN rail installation set	215094
PPS plastic grid filter with stainless steel net	DRW010281SP
PPS plastic grid filter	DRW010276SP
Stainless steel sintered filter	HM47280SP

HMT334 Humidity and Temperature Transmitter for High Pressure and Vacuum Applications

The HMT334 is ideal for permanent installations in pressurized or vacuum processes.

The Vaisala HUMICAP® Humidity and Temperature Transmitter HMT334 is designed for humidity measurement in pressurized spaces or vacuum chambers. Every probe is tested for gas and vacuum-tight installation.

Typical Applications

- test chambers
- high-pressure and vacuum processes

Technical Data

Temperature measurement range	-70 ... +180 °C (-94 ... +356 °F)
Operating pressure	0 ... 10 MPa (0 ... 100 bar)

Accessories

Fitting body ISO M22 x 1.5	17223SP
Fitting body NPT 1/2"	17225SP
USB service port cable with PC software	219916
Connection cable for HM70	211339
Wall-mounting plate (plastic)	214829
Pole installation kit with rain shield	215109
DIN rail installation set	215094
PPS plastic grid filter with stainless steel net	DRW010281SP
PPS plastic grid filter	DRW010276SP
Stainless steel sintered filter	HM47280SP
Stainless steel grid filter	HM47453SP

HMT335 Humidity and Temperature Transmitter for High Temperatures

The HMT335 has a robust stainless steel probe, ideal for hot processes with high flow rates.

The Vaisala HUMICAP® Humidity and Temperature Transmitter HMT335 has a long stainless steel probe designed for high temperatures.

Robust Probe Ideal for High Flow Rates

With high tolerance for mechanical stress and high flow rates, the HMT335 is ideal for duct measurements. The stainless steel installation flange allows easy adjustment of the probe's installation depth.

Typical Applications

- hot drying processes
- food processes, e.g. baking ovens

The installation flange allows easy adjustment of the probe installation depth.

Technical Data

Temperature measurement range	-70 ... +180 °C (-94 ... +356 °F)

Accessories

Mounting flange	210696
USB service port cable with PC software	219916
Connection cable for HM70	211339
Wall-mounting plate (plastic)	214829
Pole installation kit with rain shield	215109
DIN rail installation set	215094
PPS plastic grid filter with stainless steel net	DRW010281SP
PPS plastic grid filter	DRW010276SP
Stainless steel sintered filter	HM47280SP
Stainless steel grid filter	HM47453SP

HMT337 Humidity and Temperature Transmitter for High Humidity Applications

The HMT337 is ideal for the most demanding process and meteorological measurements in high-humidity condensing environments.

Typical Applications

- professional meteorology
- intake air monitoring of engines and gas turbines
- timber drying kilns

Duct installation kit for HMT333 and HMT337.

The Vaisala HUMICAP® Humidity and Temperature Transmitter HMT337 is delivered in one of three configurations:

- Basic, with a non-warmed probe for moderate humidity
- With a warmed probe, for near-condensing conditions and dew point measurement
- With a warmed probe and an additional temperature sensor, for near-condensing conditions and relative humidity measurement

True Humidity Readings in Condensation Conditions

Vaisala's unique warmed probe provides fast and reliable measurement in environments where humidity is near saturation. The heating prevents condensation from forming on the sensor.

As the probe is heated, the humidity level inside it stays below the ambient level. With accurate temperature measurement, the ambient dew point can be calculated precisely.

If the relative humidity value is needed, an additional temperature sensor is used. The measured ambient temperature provides the compensation for calculating relative humidity and other humidity parameters.

Installation Options

Tight installation through a process wall can be achieved with Swagelok® fittings. The optional HMT330MIK Installation Kit is available for outdoor installations; duct installation kits are also available.

Technical Data

Temperature measurement range	-70 ... +180 °C (-94 ... +356 °F)

Accessories*

Cable gland and AGRO	HMP247CG
Duct installation kit (RH probe)	210697
Duct installation kit (T probe)	215003
Swagelok fittings (NPT and ISO) for both RH and T probes (up to 10 bar)	
Solar radiation shield	DTR502B
Meterological installation kit	HMT330MIK
USB service port cable with PC software	219916
Connection cable for HM70	211339
Wall-mounting plate (plastic)	214829
Pole installation kit with rain shield	215109
DIN rail installation set	215094
Warmed probe accessory	HMT330WPA
PPS plastic grid filter with stainless steel net	DRW010281SP
PPS plastic grid filter	DRW010276SP
Stainless steel sintered filter	HM47280SP
Stainless steel grid filter	HM47453SP

*for more installation accessories, check the order form

HMT338 Humidity and Temperature Transmitter for Pressurized Pipelines

The HMT338 is ideal for installations in pressurized processes where the probe needs to be removed while the process is running.

Typical Applications

- process lines
- environmental chambers
- vacuum-drying processes
- compressed air lines with refrigerant dryers

The Vaisala HUMICAP® Humidity and Temperature Transmitter HMT338 is designed for pressurized processes.

Insert or Remove the Probe while the Process is Running

With “hot tapping”, the probe is inserted directly into the process while it is running, without the need for venting or lowering the process pressure.

The probe is tightened to a ball-valve assembly fixed to the process pipe or wall. The adjustable hex nut is hand-tightened to temporarily hold the probe in place. The probe is then pushed down to the appropriate depth. The hex nut is then tightened with a wrench to lock the probe in place. Hot tapping is possible in pressures up to 10 bar.

Technical Data

Temperature measurement range	-70 ... +180 °C (-94 ... +356 °F)
Operating pressure	0 ... 4MPa (0 ... 40 bar)

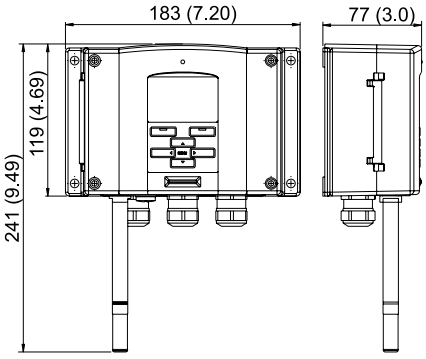
Accessories

Ball-valve set	BALLVALVE-1
Pressure fitting ISO 1/2 to NPT 1/2	210662
USB service port cable with PC software	219916
Connection cable for HM70	211339
Wall-mounting plate (plastic)	214829
Pole installation kit with rain shield	215109
DIN rail installation set	215094
PPS plastic grid filter with stainless steel net	DRW010281SP
PPS plastic grid filter	DRW010276SP
Stainless steel sintered filter	HM47280SP
Stainless steel grid filter	HM47453SP

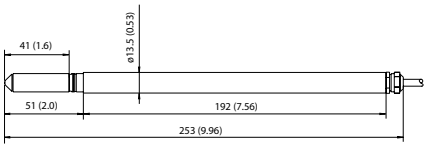
Dimensions of the Probes for the HMT330 Series

Dimensions in mm (inches)

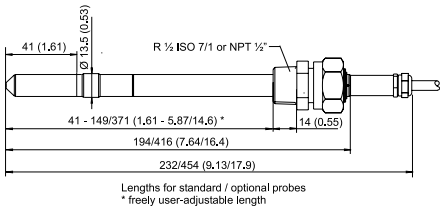
HMT331 probe



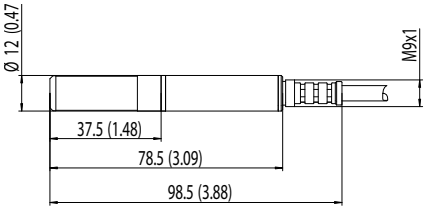
HMT335 probe



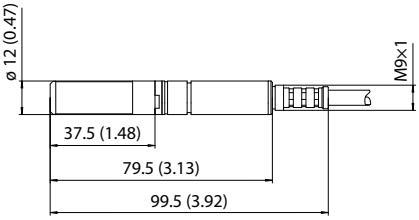
HMT338 probe



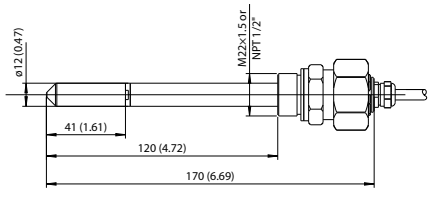
HMT333 probe



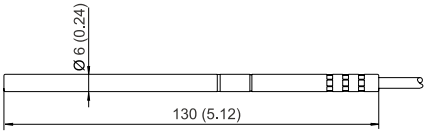
HMT337 RH probe



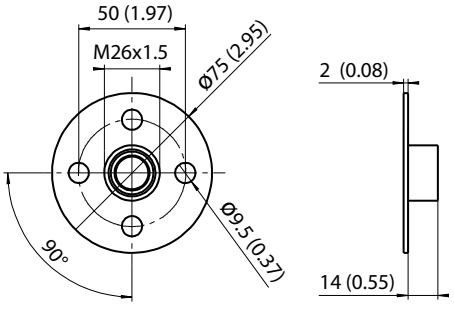
HMT334 probe

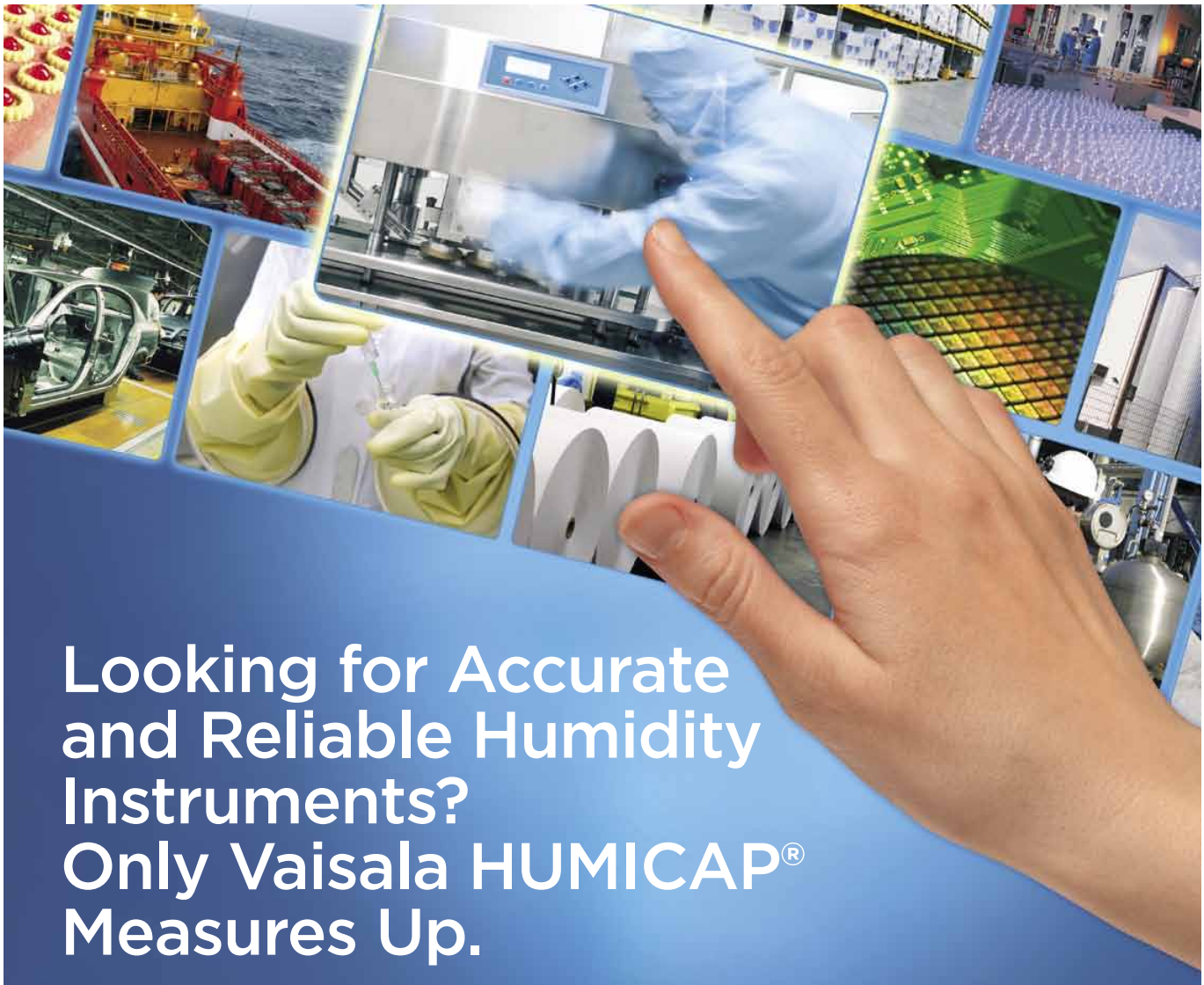


HMT337 T probe



Installation flange





Looking for Accurate and Reliable Humidity Instruments? Only Vaisala HUMICAP® Measures Up.

The quality and profitability of your process equals the quality of your measurement.

The success of critical operations depends on small things, such as our humidity sensor. The Vaisala HUMICAP® technology has led the market for almost 40 years through unrivaled reliability continually introducing innovative features for better stability and usability.

Resistant to dust, particulate dirt and most chemicals, Vaisala HUMICAP® delivers the most accurate humidity measurements on the market, even in the harshest conditions.

Choose from a wide range of fixed and handheld instruments for different applications, requirements and budgets.

Improve efficiency, quality, safety and profitability. Vaisala HUMICAP® helps deliver them all.

VAISALA

HMT360 Series Intrinsically Safe Humidity and Temperature Transmitters

The Vaisala HUMICAP® Humidity and Temperature Transmitter HMT361 wall mount transmitter, shown with six probe options, is designed specifically for hazardous and explosive environments.

Features/Benefits

- Measures humidity and temperature, outputs also dew point, mixing ratio, absolute humidity and wet bulb temperature
- Safe operation with the entire transmitter in hazardous areas: Division 1 and 2 (USA, Canada), Categories 1G / Zone 0 and 1D / Zone 20 with protection cover (EU)
- Intrinsically safe
- Designed for harsh conditions
- Vaisala HUMICAP® Sensor features high accuracy, excellent long-term stability, and negligible hysteresis
- Six probe options
- Temperature range between -70 ... +180°C (-94 ... +356°F) depending on the probe option
- NIST traceable (certificate included)

The Vaisala HUMICAP® Humidity and Temperature Transmitter Series HMT360 are the ideal solution for measuring humidity in hazardous areas. They operate safely and reliably even in the most hazardous classifications. The HMT360 transmitters' proven performance and technology conform with rigorous international standards.

Intrinsically Safe

The entire HMT360 transmitter can be installed directly in explosive areas. It can withstand continuous exposure to potentially explosive environments that contain flammable gases or dust.

Customized Configuration

Due to the microprocessor based electronics, options and accessories, the HMT360 series is truly flexible.

Customers may specify the transmitter configuration when ordering the instrument, however changes in configuration can also easily be made in the field.

Interchangeable Probes

The HMT360 offers six probe options for various applications:

HMP361	- wall mount
HMP363	- confined spaces
HMP364	- pressurized spaces
HMP365	- high temperature
HMP367	- high humidity
HMP368	- pressurized pipelines

The interchangeable probes enable fast and easy removal or re-installation when required. Calibration, for example, is easy to perform due to the modular structure. All calibration coefficients are included in the probe unit itself, which means that probes can be switched between transmitter bodies without losing the accuracy.

Optimized Sensors

In addition to the standard Vaisala HUMICAP® Sensor, an application specific, very chemically durable sensor is also available.

Long-term Solution

The HMT360 transmitters are an investment; their rugged design, combined with trouble-free operation, ensure a long-term solution for monitoring humidity and dew point in explosive environments.

Customized calibration and maintenance contracts for the HMT360 series are available on request.

Interchangeable Probes for HMT360 Intrinsically Safe Humidity and Temperature Transmitter

The HMP361 probe in this picture has a stainless steel netting filter.

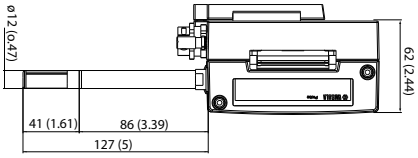
Technical Data

HMP361 for wall mounting

Temperature range	-40 ... +60 °C (-40 ... +140 °F)
Probe diameter	12 mm

Dimensions

Dimensions in mm (inches)



The HMP363 probe is small and fits into tight spaces. This one is connected with a teflon cable.

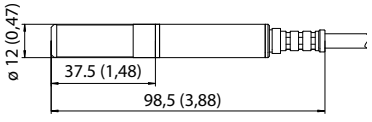
Technical Data

HMP363 for confined spaces

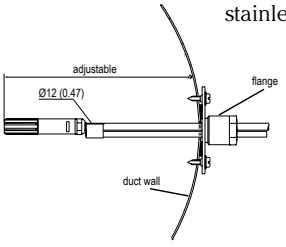
Temperature range with	
teflon cable	-40 ... +120 °C (-40 ... +248 °F)
rubber cable	-40 ... +80 °C (-40 ... +176 °F)
Probe cable length	2, 5 or 10 meters
Probe diameter	12 mm
Installation	
Duct installation kit	210697
Cable Gland M20x1.5 with splitting seal	HMP247CG
Swagelok for 12mm probe, 1/2" NPT thread	SWG12NPT12

Dimensions

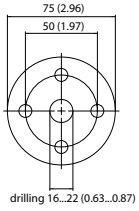
Dimensions in mm (inches)



Installation kit for duct mounting



Installation flange: aluminum or stainless steel



The HMP364 probe is designed for measurement in pressurized spaces or vacuum chambers.

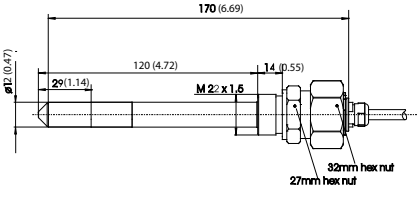
Technical Data

HMP364 for high pressure

Temperature range	-70 … +180 °C (-94 … +356 °F)
Pressure range	0 ... 10 MPa
Probe cable length	2, 5 or 10 meters
Probe diameter	12 mm
Fitting body M22x1.5	17223
Fitting body NPT1/2	17225

Dimensions

Dimensions in mm (inches)



The HMP365 probe is designed for high temperature environments.

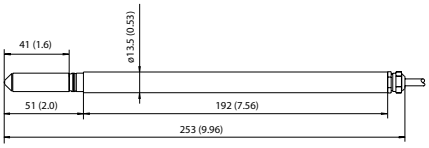
Technical Data

HMP365 for high temperature

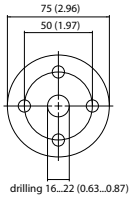
Temperature range	-70 … +180 °C (-94 … +356 °F)
Probe cable length	2, 5 or 10 meters
Probe diameter	13.5 mm
Installation	
Mounting flange	210696
Cable Gland M20x1.5 with splitting seal	HMP247CG

Dimensions

Dimensions in mm (inches)



Installation flange: stainless steel



The HMP367 probe is constructed to be installed in environments with high humidities.

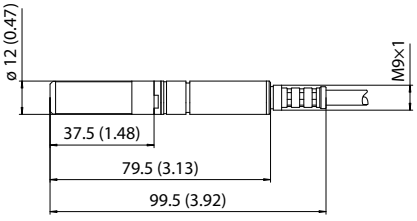
Technical Data

HMP367 for high humidities

Temperature range	-70 … +180 °C (-94 … +356 °F)
Probe cable length	2, 5 or 10 meters
Probe diameter	12 mm
Installation	
Duct installation kit	210697
Cable Gland M20x1.5 with splitting seal	HMP247CG
Swagelok for 12mm probe, 3/8" ISO thread	SWG12ISO38
Swagelok for 12mm probe, 1/2" NPT thread	SWG12NPT12

Dimensions

Dimensions in mm (inches)



The HMP368 probe enables flexible installation in pressurized pipelines.

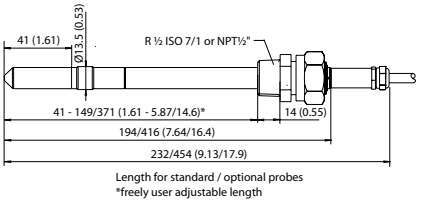
Technical Data

HMP368 for pressurized pipelines

Temperature range	-70 … +180 °C (-94 … +356 °F)
Pressure range	0 ... 4 MPa
Probe cable length	2, 5 or 10 meters
Probe diameter	13.5 mm/12 mm
Two probe lengths available.	
Installation	
Fitting body ISO1/2 solid structure	DRW212076SP
Fitting body NPT1/2 solid structure	NPTFITBODASP
Ball valve ISO 1/2 with welding joint	BALLVALVE-1

Dimensions

Dimensions in mm (inches)



Technical Data

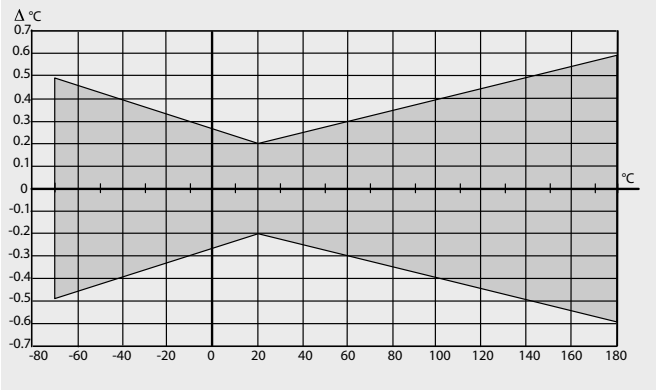
Performance

RELATIVE HUMIDITY

Measurement range	0 ... 100 % RH
Accuracy (including non-linearity, hysteresis, and repeatability)	
with Vaisala HUMICAP® 180R	for typical applications
at +15 ... +25 °C (59 ... +77 °F)	± 1.0 % RH (0 ... 90 %RH) ±1.7 %RH (90 ... 100 %RH)
at -20 ... +40 °C (-4 ... +104 °F)	±(1.0 + 0.008 x reading) %RH
at -40 ... +180 °C (-40 ... +356 °F)	± (1.5 +0.015 x reading) %RH
with Vaisala HUMICAP® 180$_L$2	for application with demanding chemical environment
at -10 ... +40 °C (14 ... +104 °F)	± (1.0 + 0.01 x reading) %RH
at -40 ... +180 °C (-40 ... +356 °F)	± (1.5 + 0.02 x reading) %RH
Factory calibration uncertainty (+20 °C)	± 0.6 % RH (0 ... 40 %RH) ± 1.0 % RH (40 ... 97 %RH)
	(Defined as ±2 standard deviation limits. Small variations possible, see also calibration certificate.)
Response time (90 %) at +20 °C (+68 °F) in still air	
with grid filter	17 s
with grid + steel netting filter	50 s
with sintered filter	60 s

TEMPERATURE

Measurement range	-70 ... +180 °C (-94 ... +356 °F) (depends on selected probe)
Typical accuracy of electronics at +20 °C (+68 °F)	±0.2 °C (0.36 °F)
Typical temperature dependence of electronics	0.005 °C/°C (0.005 °F/°F)
Sensor	Pt1000 RTD Class F0.1 IEC 60751
Accuracy over temperature range	



OTHER VARIABLES

Optionally available	dew point temperature, mixing ratio, absolute humidity, wet bulb temperature.

Operating Environment

Temperature range	
operating temp. range for electronics	-40 ... +60 °C (-40 ... +140 °F)
with display	-20 ... +60 °C (-4 ... +140 °F)
storage	-40 ... +70 °C (-40 ... +158 °F)
Pressure range	see probe specifications

Complies with EMC standard EN61326-1, Electrical equipment for measurement, control and laboratory use - EMC requirements; Industrial Environment.
NOTE! IEC 1000-4-5 complies only when using external EXi approved surge arrester in the safe area.

Inputs and Outputs

Operating voltage	12 ... 28 V
with serial port (service mode)	15 ... 28 V
Analog outputs	two-wire 4 ... 20 mA, one standard, one optional
Typical accuracy of analog outputs at +20 °C	±0.05% full scale
Typical temperature dependence of analog outputs	0.005% / °C (0.005% / °F) full scale
Analog outputs	connection via safety barriers
RS232C serial output for service use	connector type RJ45
Display	two-line LCD

Mechanics

Connections	screw terminals, 0.33...2.0 mm 2 wires (AWG 14-22)
Cable bushings	For 7.5...12mm or 10...15mm cable diameters (M20)
Conduit fitting	NPT 1/2" (M20)
Housing material	G-AlSi$_i$10Mg (DIN 1725)
Housing classification	IP66 (NEMA 4X)
Housing weight	950 g

Options and Accessories

Duct installation kit (for HMP363/367)	210697
Mounting flange (for HMP365)	210696
Ball valve ISO 1/2 with welding joint (for HMP368)	BALLVALVE-1
pressure range at +20 °C (+68 °F):	0 ... 20 bar (0 ... 290 psia) (during installation max. 10 bar (145 psia)
Calibration adapter for HMK15	211302
Serial interface cable for PC connectors RJ45 - D9 female	25905ZZ
Galvanic isolator	212483
Zener barrier	210664
Protection cover (for use in the presence of combustible dust, ATEX)	214101 II 1 D IP65 T = 70 °C

Classification with Current Outputs

EUROPE / VTT

EU (94/9/EC, ATEX100a)	II 1 G Ex ia IIC T4 Ga
	VTT 09 ATEX 028 X issue No: 2
Safety factors	U_i = 28 V, I_i = 100 mA, P_i = 700 mW
	C_i = 1 nF, L_i negligibly low
Environmental specifications	
T_{amb}	-40 ... +60 °C (-40 ... +140 °F)
P_{amb}	0.8 ... 1.1 bar
Dust classification (with protection cover)	II 1 D (IP65 T=70 °C)
	VTT 04 ATEX 023X

USA (FM)

	Classes I, II, III, Division 1, Groups A-G and Division 2, Groups A-D, F and G
	FM Project ID: 3010615
Safety factors:	Vmax = 28 VDC, I_{max} = 100 mA, C_i = 1 nF, L_i = 0, P_i = 0.7 W, T_{amb} = 60 °C(140 °F), T5

JAPAN (TIIS)

	Ex ia IIC T4
	Code number: TC20238
Safety factors:	U_i = 28 VDC, I_i = 100 mA, C_i = 1 nF, P_i = 0.7 W, L_i = 0, T_{amb} = 60 °C (140 °F)

CANADA (CSA)

Class I	Division 1 and Division 2, Groups A, B, C, D;
Class II	Division 1 and Division 2, Groups G and Coal Dust;
Class III	CSA File No: 213862 0 000, CSA Report: 1300863
Safety factors:	T_{amb} = 60 °C, T4, Intrinsically safe when connected as per Installation Drawing DRW213478.

CHINA (PCEC)

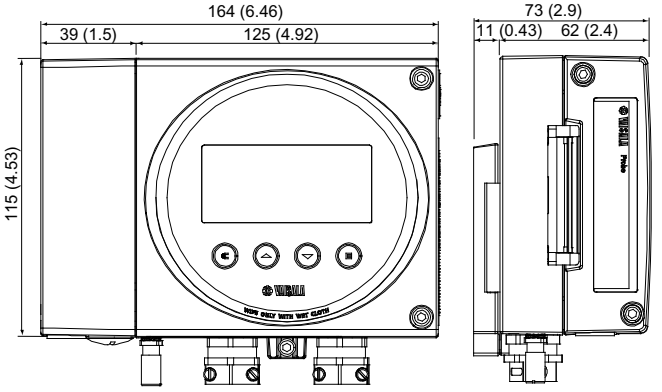
	Ex ia II CT4
	Certificate No. CE092145
	Standard GB3836.1-2000 and GB3836.4-2000

IECEx (VTT)

	Ex ia IIC T4 Ga
	IECEx VTT 09.0002x issue No: 2
Safety factors	U_i = 28 V, I_i = 100 mA, P_i = 700 mW
	C_i = 1 nF, L_i negligibly low
Environmental specification	
T_{amb}	-40 ... +60 °C (-40 ... +140 °F)
P_{amb}	0.8 ... 1.1 bar

Dimensions

Dimensions in mm (inches)



Accessories

		HMT361	HMT363	HMT364	HMT365	HMT367	HMT368
Accessory	**part number**						
Ball valve ISO 1/2 with welding joint	BALLVALVE-1						√
Cable Gland M20 x 1.5 with splitting seal	HMP247CG		√		√	√	
Duct installation kit	210697		√			√	
Fitting body ISO1/2 solid structure	DRW212076SP						√
Fitting body M22 x 1.5	17223			√			
Fitting body NPT1/2	17225			√			
Fitting body NPT1/2 solid structure	NPTFITBODASP						√
Mounting flange	210696				√		
Swagelok for 12mm probe, 1/2" NPT thread	SWG12NPT12		√			√	
Swagelok for 12mm probe, 3/8" ISO thread	SWG12ISO38		√			√	

VAISALA

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HMT310 Humidity and Temperature Transmitter

The Vaisala HUMICAP® Humidity and Temperature Transmitter HMT310 models (from left to right): HMT313, HMT317, HMT314, HMT318, HMT315 and HMT311.

Features/Benefits

- Latest generation Vaisala HUMICAP® sensor for excellent accuracy and stability
- Full 0 ... 100 %RH measurement, temperature range up to +180 °C (+356 °F), depending on model
- Small size, easy to integrate
- Insensitive to dust and most chemicals
- NIST traceable calibration (certificate included)

Reliable Vaisala HUMICAP® Technology

The HMT310 incorporates the latest generation Vaisala HUMICAP® sensor. The sensor is a capacitive thin-film polymer sensor providing high accuracy, excellent long-term stability and negligible hysteresis. It is insensitive to dust, particulate dirt and most chemicals.

Several Outputs, One Connector

The HMT310 is powered up with 10 ... 35 VDC. It has two analog outputs and an RS232 serial output. The output signal and the supply power travel in the same cable, the only cable connected to the unit.

Chemical Purge

Chemical purge helps to maintain measurement accuracy between calibration intervals. It involves heating the sensor to remove harmful chemicals. The function can be initiated manually or programmed to occur at set intervals.

Optional Functions

The following optional functions are available: several probes for various applications, calculated humidity quantities, variety of mounting kits, rain shield, sensor protection options and probe cable lengths, warmed probe and sensor heating for high humidity conditions (HMT317), and chemical purge for applications risking an interference with chemicals in the measuring environment.

Technical Data

Measured Values

RELATIVE HUMIDITY

Measurement range	0 ... 100 %RH
Sensor	
Vaisala HUMICAP®180R	typical applications
Vaisala HUMICAP®180RC	applications with chemical purge/warmed probe
Vaisala HUMICAP®180VHP	catalytic sensor for H_2O_2 environments
Vaisala HUMICAP®180VHPC	catalytic sensor with chemical purge for H_2O_2 environments
Accuracy (including non-linearity, hysteresis, and repeatability) at a temperature range of	
+15 ... +25 °C (+59 … +77 °F)	±1 %RH (0 ... 90 %RH) ±1.7 %RH (90 ... 100 %RH)
-20 ... +40 °C (-4 … +104 °F)	±(1.0 + 0.008 x reading) %RH
-40 ... +180 °C (-40 … +356 °F)	±(1.5 + 0.015 x reading) %RH
Factory calibration uncertainty (+20 °C)	±0.6 %RH (0 ... 40 %RH)* ±1.0 %RH (40 ... 97 %RH)*

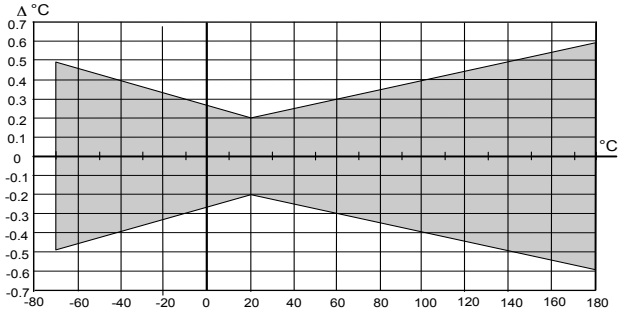
** Defined as ±2 standard deviation limits. Small variations possible, see also calibration certificate.*

Response time (90 %) at +20 °C (+68 °F) in 0.1 m/s air flow	17 s with grid filter 50 s with grid and steel, netting filter 60 s with sintered filter

TEMPERATURE

HMT311	-40 ... +60 °C (-40 ... +140 °F)
HMT313	-40 ... +80 °C (-40 ... +176 °F) or -40 ... +120 °C (-40 ... +248 °F)
HMT314, HMT315, HMT317, HMT318	-70 ... +180 °C (-94 ... +356 °F)
Typical accuracy at +20 °C (+68 °F)	±0.2 °C (±0.36 °F)

Accuracy over temperature range (see graph below)



Temperature sensor	Pt100 RTD Class F0.1 IEC 60751

Electrical Connections

Two analog outputs, selectable and scalable	0 ... 20 mA or 4 ... 20 mA 0 … 5 V or 0 … 10 V 1 … 5 V available through scaling
Typical accuracy of analog output at +20 °C	±0.05 % full scale
Typical temperature dependence of analog output	0.005 %/°C (0.003 %/°F) of full scale
Serial output	RS232C
Connections	M12 8-pole connector with RS232C, current/voltage outputs (two channels) and U_{in}
Operating voltage	10 ... 35 VDC
Minimum operating voltage	
RS232C output	10 VDC
Analog output	15 VDC
Probe heating and chemical purge	15 VDC
Pressures above 10 bara (145 psia)	24 VDC
Power consumption	
RS232	12 mA
U_{out} 10 V (10 kOhm) channel 1 & channel 2	12 mA
I_{out} 20 mA (load 511 Ohm) channel 1 & channel 2	50 mA
Chemical purge at 24 VDC	+ 220 mA
Warmed probe at 24 VDC	+ 240 mA
External load	R_L < 500 Ohm
Startup time after power-up	3 s

General

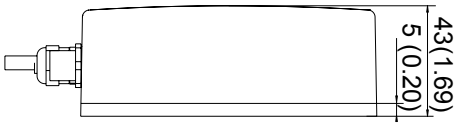
Operating temperature range for electronics	-40 ... +60 °C (-40 ... +140 °F)
Storage temperature range	-55 ... +80 °C (-67 ... +176 °F)
Operating pressure	
HMT314	0 ... 100 bar
HMT318	0 ... 40 bar
HMT315, HMT317	vapor tight
Transmitter housing material	G-AlSi10Mg
Transmitter base material	PPS
Housing classification	IP66
Cable feed through alternatives	8-pole connector with 5 m cable, Female 8-pin connector screw joint for cable diameter 4 ... 8 mm
Probe cable length	2m, 5m, or 10m
Sensor protection	PPS grid with stainless steel net, PPS grid, Sintered filter, Membrane stainless steel filter, VHP filter
Complies with EMC standard EN61326-1, Industrial environment	

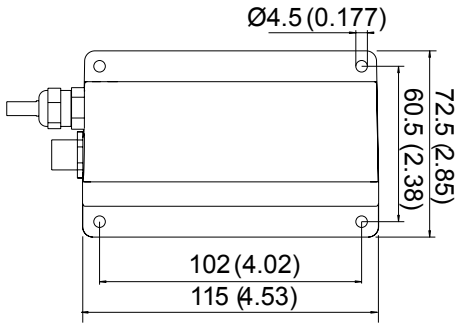
Accessories

Rain shield	ASM211103
USB cable	238607
PPS Plastic Grid with Stainless Steel Netting	DRW010281SP
PPS Plastic Grid Filter	DRW010276SP
Sintered Filter AISI 316L	HM47280SP
Stainless Steel Filter	HM47453SP
Stainless Steel Filter with Membrane	214848SP
Catalytic VHP Filter	231865

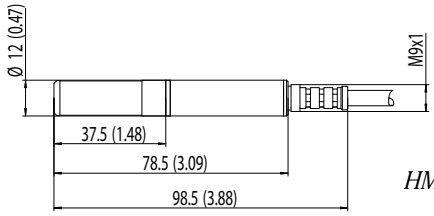
Dimensions

Transmitter body dimensions in mm (inches)

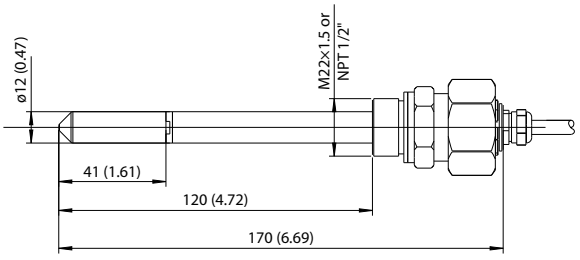




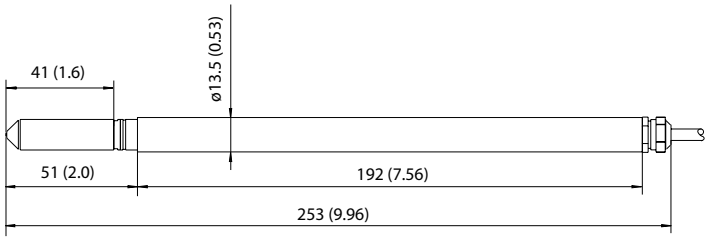
Probe dimensions in mm (inches)



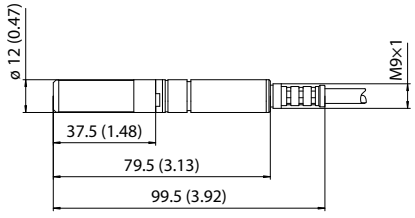
HMT313 probe



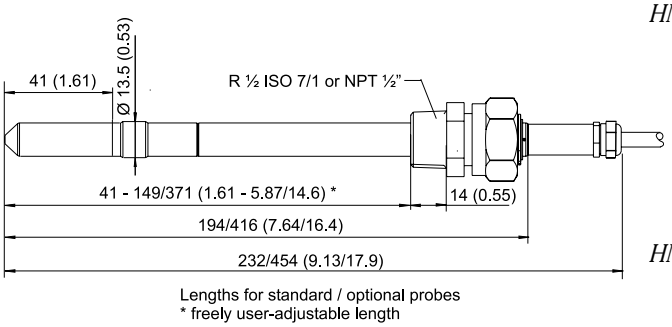
HMT314 probe



HMT315 probe



HMT317 probe



HMT318 probe

Lengths for standard / optional probes
* freely user-adjustable length

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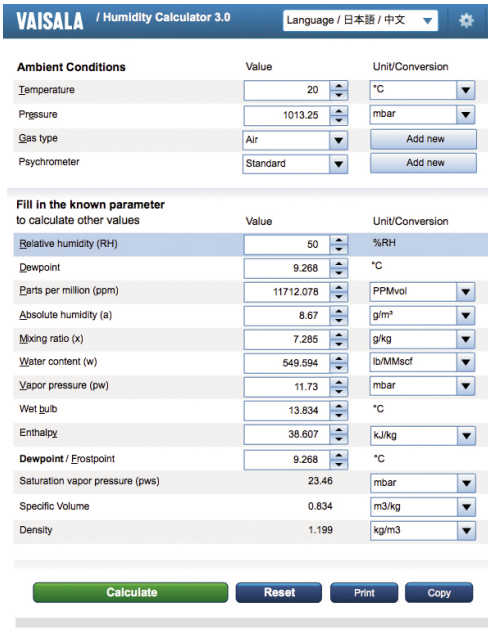
Calculate and Convert.

The free web based Vaisala Humidity Calculator allows you to calculate several humidity parameters from one known humidity value. Make unit conversions on the fly, and see the effects of changing ambient conditions, like temperature and pressure. The calculator is available in several languages.

Access or download
the Vaisala Humidity Calculator at
www.vaisala.com/humiditycalculator



Available also as:

iPhone app

Android app

Vaisala HUMICAP® Humidity and Temperature Transmitters HMT120 and HMT130

The HMT120/130 with and without a display.

The Vaisala HUMICAP® Humidity and Temperature Transmitters HMT120 and HMT130 are designed for humidity and temperature monitoring in cleanrooms and are also suitable for demanding HVAC and light industrial applications.

Performance

The HMT120/130 incorporates Vaisala HUMICAP® technology that measures relative humidity accurately and reliably. The Vaisala HUMICAP® is resistant to dust and most chemicals.

The transmitter enclosure is optimized for use in cleanrooms. The smooth surface of the enclosure makes it easy to clean and the enclosure material is chosen to tolerate purifying agents. Furthermore, the cabling can be done through the back wall of the transmitter.

Interchangeable Probe

The HMT120/130 transmitters use a fully interchangeable relative humidity probe. The probe can be easily removed and replaced with a new one without having to adjust the transmitter, which allows for easy and quick recalibration of the transmitter. The probe can be adjusted using one of Vaisala's portable meters as a reference.

Also available is a constant output probe with fixed RH and T output for convenient inspection of the monitoring system and signal transfer line.

Available Options

The HMT120 and HMT130 transmitters are available as wall mounted or with remote probe. For high temperature applications or where space is limited, the remote probe is ideal. The transmitters come with an optional LCD display, which shows the measurement results of selected parameters in selected units. The parameters are displayed simultaneously at two separate rows on the display.

Features/Benefits

- Vaisala HUMICAP® technology with humidity sensor HUMICAP® 180R
- Humidity parameter options: relative humidity, dew point/frost point, wet bulb temperature, enthalpy, absolute humidity, mixing ratio, vapor pressure, and saturation vapor pressure
- 2-wire loop-powered or 3-wire voltage output configurations
- Interchangeable probe (easy field calibration)
- Accurate and reliable
- Resistant to dust and most chemicals
- Optional LCD display
- USB cable available for a PC connection for maintenance
- Wall-mounted or with a remote probe
- Constant output probe available
- Can be mounted outdoors using a Vaisala installation kit and the Vaisala Radiation Shield DTR504A
- Enclosure IP65
- 3-point NIST traceable calibration (certificate included)
- Suitable for cleanrooms and demanding HVAC and light industrial applications

Technical Data

Performance

RELATIVE HUMIDITY	
Measurement range	0 ... 100 %RH
Accuracy including non-linearity, hysteresis, and repeatability	
temperature range	0 °C ... +40 °C
0 ... 90 %RH	±1.5 %RH
90 ... 100 %RH	±2.5 %RH
temperature range	-40 ... 0 °C, +40 ... +80 °C
0 ... 90 %RH	±3.0 %RH
90 ... 100 %RH	±4.0 %RH
Factory calibration uncertainty at +20 °C (+68 °F)	
0 ... 90 %RH	±1.1 %RH
90 ... 100 %RH	±1.8 %RH
Humidity sensor	Vaisala HUMICAP® 180R
Stability	±2 %RH over 2 years
In typical HVAC applications	±0.5 %RH per year
TEMPERATURE	
Measurement range	-40 °C ... +80 °C
Accuracy over temperature range	
at +15 °C ... +25 °C	±0.2 °C
at 0 ... +15 °C and at +25 °C ... +40 °C	±0.25 °C
at -40 °C ... +0 °C and at +40 °C ... +80 °C	±0.4 °C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
OTHER VARIABLES (OPTIONAL)	
dew point/frost point, wet bulb temperature, enthalpy, absolute humidity, mixing ratio, vapor pressure, and saturation vapor pressure	

Operating Environment

Operating temperature range	
transmitter body, no display	-40 °C ... +60 °C
transmitter body, with display	-20 °C ... +60 °C
HMP110 probe	-40 °C ... +80 °C
Storage temperature range	-50 °C ... +70 °C
Electromagnetic compatibility	EN 61326-1 and EN 55022

Mechanics

Material	
transmitter housing	PBT plastic
display window	PC plastic
probe body	Stainless steel (AISI 316)
probe grid filter	Chrome coated ABS plastic
Housing classification	IP65
Connections	
inputs and outputs	Screw terminals 0.5 ... 1.5 mm^2
probe interface	4-pin M8 female panel connector
Probe cable lengths	3 m, 5 m, 10 m - up to 50 m
Display (optional)	128 x 64 resolution full graphics B&W display without backlight
Weight (including probe)	270 g

Inputs and Outputs

HMT120 TWO-WIRE TRANSMITTER (LOOP POWERED)	
Current output signals	4 ... 20 mA
External loop voltage	10 ... 30 VDC (R_L= 0 ohms) 20 ... 30 VDC (R_L< 500 ohms)
HMT130 THREE-WIRE TRANSMITTER	
Voltage output signals	0 ... 1 V, 0 ... 5 V, 0 ... 10 V or user defined between 0 ... 10 V
Min output resistance	1 kohm
Serial output	RS485, non-isolated
Relay output	1 relay (max. 50 VDC, 200 mA)
Supply voltage	10 ... 35 VDC 15 ... 35 VDC (when output 0 ... 10 V) 24 VAC (±20 %)
Current consumption at 24 VDC	8 mA, if relay closed 15 mA
Max. additional error caused by the analog outputs after calibration at +20 °C ambient temperature	±0.1 % of FS output signal
Temperature dependence of the analog outputs	±0.005 % of FS output signal

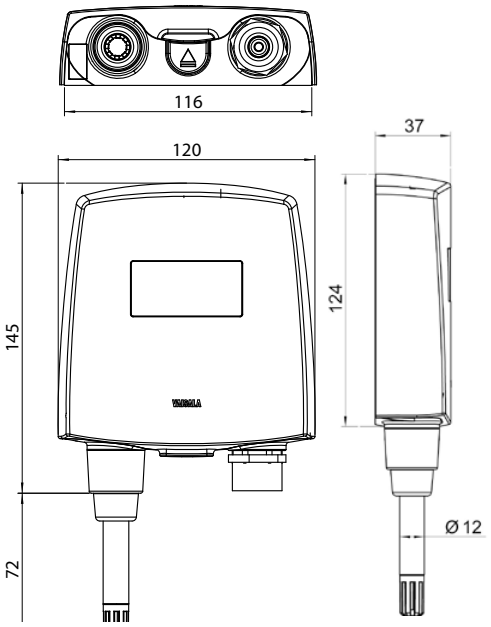
Accessories

Humidity and temperature probe	HMP110*
Humidity and temperature replacement probe	HMP110R*
Constant output probe	HMP110REF*
Humidity sensor	HUMICAP® 180R
Probe mounting flange	226061
Probe mounting clamps, 10 pcs	226067
HMP110 sensor protection	
plastic grid filter	DRW010522SP
plastic grid with membrane filter	DRW010525SP
stainless steel sintered filter	HM46670SP
Probe cable 3 m	HMT120Z300
Probe cable 5 m	HMT120Z500
Probe cable 10 m	HMT120Z1000
Radiation shield	DTR504A
Rain shield with installation kit	215109
Duct installation kit	215619
HMI41 connection cable	25917ZZ
HM70 connection cable	211339
USB serial interface cable	219685

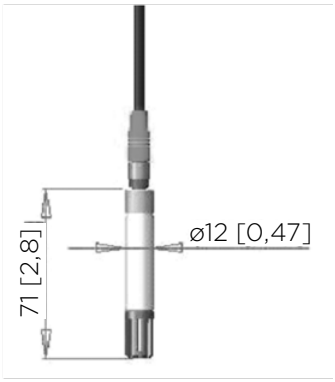
**See separate order form*

Dimensions

Dimension in mm



Remote probe dimensions



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The four-step Vaisala Humidity Expert Series will give you all you need to know to become an expert in humidity.

- Convert different humidity parameters
- Make easy calculations with Vaisala Humidity Calculator
- Learn the optimal calibration methods for humidity calibration
- Get familiar with the operational principle of your humidity sensor

Getting access to all this expertise is easy – sign up now at **www.vaisala.com/humidityexpert**

HMW90 Series Humidity and Temperature Transmitters for High Performance HVAC Applications

The HMW90 Series Humidity and Temperature Transmitters are designed for demanding HVAC applications.

Features/Benefits

- Both analog and digital output
- Easy installation, configuration, and field adjustment
- Humidity parameter options: relative humidity, dew point, mixing ratio, enthalpy, wet bulb temperature, dew point depression, and absolute humidity
- Full 0 ... 100%RH measurement range
- Up to ±1.7%RH accuracy
- User exchangeable humidity and temperature module
- NIST traceable calibration (certificate included)
- Available in four colors

BACnet in Brief

- A data communication protocol for Building Automation and Control networks
- Used in management, automation and field level communication
- ANSI/ISO/ASHRAE standard controlled by a standardization body
- Adds flexibility by allowing the integration of products and systems from different manufacturers

Wall-mounted Vaisala HMW90 Series HUMICAP® Humidity and Temperature Transmitters measure relative humidity and temperature in indoor HVAC applications, where high accuracy, stability, and reliable operation are required.

The flexible HMW90 series offers a variety of options and features. Transmitters include a display and a sliding cover with either an opening for the display or a solid front. Both analog and digital output options, including special scalings and calculated parameters, are available.

Quick and Easy to Install

HMW90 series transmitters are quick and easy to install. The wiring is connected through the back plate and the electronics with the sensors can be snapped on easily after the wiring is complete. The transmitter is configured using dip switches, which are accessible when the enclosure is open.

Digital Communication Brings Benefits

The introduction of digital (BACnet/Modbus) communication to field level devices brings many advantages. For example, all sensors can be centrally accessed and their performance can be easily monitored. Wiring is simple when multiple sensors are installed on the same bus. Sensors can be set up using standardized tools, and the system can be enlarged with additional sensors quickly and conveniently. In addition, parameters influencing measurements, such as pressure or site elevation, can be centrally set and updated.

Choose from a Wide Variety of Calibration Options

On-site calibration and adjustment is exceptionally easy. The sliding cover exposes offset trimmers for one-point calibration without disturbing measurement. The display instantly indicates the effects of changes, making it clear and convenient to make adjustments. A service port enables two-point calibration, using either a PC or the Vaisala HUMICAP® Hand-Held Humidity and Temperature Meter HM70. HMW90 series transmitters include a user-exchangeable measurement module, which can be ordered as a spare part. Calibration services are available through all Vaisala Service Centers.

Technical Data

Models

TMW92	T-only	2-wire, current output
TMW93	T-only	3-wire, voltage output
TMW90	T-only	configurable analog output model
HMW92	RH+T	2-wire, current output
HMW92D	RH+T	2-wire, current output with display
HMW93	RH+T	3-wire, voltage output
HMW93D	RH+T	3-wire, voltage output with display
HMW90	RH+T	Configurable analog/digital model
HMW95	RH+T	Digital (BACnet, Modbus) model
HMW95D	RH+T	Digital (BACnet, Modbus) model with display

Performance

RELATIVE HUMIDITY	
Measurement range	0 ... 100 %RH, non-condensing
Accuracy	
Temperature range	+10 ... +40 °C (+50 ... +104 °F)
0 ... 90 %RH	±1.7 %RH
90 ... 100 %RH	±2.5 %RH
Temperature range	-5 ... +10 °C, +40 ... + 55 °C (+23 ... +50 °F, +104 ... +131°F)
0 ... 90 %RH	±3 %RH
90 ... 100 %RH	±4 %RH
Stability in typical HVAC applications	±0.5 %RH/year
Humidity sensor	Vaisala HUMICAP® 180R
TEMPERATURE	
Measurement range	-5 ... +55 °C (+23 ... +131 °F)
Accuracy	
+20 ... +30 °C (+68 ... +86 °F)	±0.2 °C (± 0.36 °F)
+10 ... +20 °C, +30 ... +40°C (+50 ... +68 °F, +86 ... +104 °F)	±0.3 °C (± 0.54 °F)
-5 ... +10 °C, +40...+55°C (+23 ... +50 °F, +104 ... +131 °F)	±0.5 °C (± 0.90 °F)
Temperature sensor	Digital temperature sensor

Operating Environment

Operating temperature range	-5 ... +55 °C (+23 ... +131 °F)
Storage temperature range	-30 ... +60 °C (-22 ... +140 °F)
Electromagnetic compliance	EN61326-1, Industrial Environment

Spare Parts and Accessories

Humidity and Temperature Module	HTM10SP
Temperature Module (for T-only models)	TM10SP
Decorative cover set (10 pcs.)	236285
Connection cable for HM70 hand-held meter	219980
USB cable for PC connection	219690

Mechanics

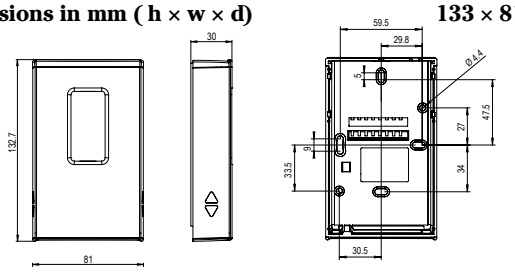
IP class	IP30
Standard housing color	White (RAL9003*)
Optional housing colors	Black (RAL9005*)
(configurable models only)	Grey (RAL7035*)
	Light Ivory (RAL1015*)
Housing material	ABS/PC, UL-V0 approved
Output connector	Screw terminals
	max. wire size 2 mm² (AWG14)
Service port connector	4-pin M8
Weight	155 g

**RAL code is only indicative with potential small variations in color shade*

Inputs and Outputs

Current output models	
Outputs	2 x 4 ... 20 mA, loop powered
Loop resistance	0 ... 600 Ω
Supply voltage	20 ... 28 VDC at 500 Ω load
	10 ... 28 VDC at 0 Ω load
Isolation between output channels	500 VDC
Voltage output models	
Outputs	2 × 0...5 V or 2 × 0...10 V
Load resistance	10 kΩ min.
Supply voltage	18 ... 35 VDC, 24 VAC ±20 % 50/60 Hz
Max. current consumption	12 mA
	max. with relay 25 mA
Relay	1 pc (max. 50 VDC, 500 mA)
Digital models	
Supply voltage	18 … 35 VDC, 24 VAC ± 20% 50/60 Hz
Max. current consumption (with 120 Ω termination)	30 mA at 24 VDC
Output type	RS-485 (galvanic isolation, 1.5 kV)
RS-485 end of line termination	Enable with jumper, 120 Ω
Supported protocols	Selectable by DIP switch
BACnet MS/TP	
Operating mode	Selectable Master/Slave
Address range, master mode	0 … 127
Address range, slave mode	128…255
Modbus RTU	
Address range	0 … 247
Service port	RS-485 line for temporary service use

Dimensions in mm (h × w × d) **133 × 81 × 30**



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HMD60/70 Humidity and Temperature Transmitters for Ducts in HVAC Applications

Vaisala HUMICAP® Humidity and Temperature Transmitters HMD60 and HMD70 are designed for use in air conditioning applications where accurate and stable control of relative humidity and temperature are required.

Features/Benefits

- Full 0 ... 100 %RH measurement
- Accuracy up to ±2 %RH
- True two-wire transmitters with 4 ... 20 mA loop powered output (HMD60)
- Selectable signal output of 0 ... 1 V, 0 ... 5 V or 0 ... 10 V (HMD70) with optional current module also 0 ... 20 mA (HMD70)
- Vaisala HUMICAP® Sensor for excellent accuracy and long-term stability, negligible hysteresis and resistance to dust and most chemicals.
- Temperature compensated
- IP65 (NEMA 4) housing
- Also available as temperature-only transmitters HMD 60T/70T
- NIST traceable (certificate included)

The duct mounted Vaisala HUMICAP® Humidity and Temperature Transmitters HMD60 and HMD70 are designed for monitoring relative humidity and temperature in building energy management systems. The combination of high accuracy, stability and reliable operation, make these products the ideal choice for demanding applications.

Resistant to Chemicals and Dust

The duct mount HMD60 and HMD70 transmitters can also be used in many industrial humidity monitoring applications, where their stability and resistance to chemicals and dust are of great value. A useful feature of these duct mount transmitters is the ability to remove the electronics without removing the unit from the duct.

Measures both Humidity and Temperature

The HMD60 and HMD70 transmitters are available in three models: U for humidity measurement-only, Y for humidity and temperature measurement, and T for temperature only.

Fast, On-Site Calibration

The accuracy of the transmitters is simple to check using either the Vaisala HUMICAP® Hand-Held Humidity and Temperature Meter HM70 or the Vaisala HUMICAP® Humidity Indicator HMI41. The calibration can be done in seconds with a single potentiometer without disturbing the operation, resulting in great savings both in maintenance time and costs.

Technical Data

60 Series: 2-wire, 4 to 20 mA Output

Duct mount	RH only	HMD60U
	RH & T	HMD60Y
	T only	HMD60T

70 Series: 3-wire, Variable Voltage Output

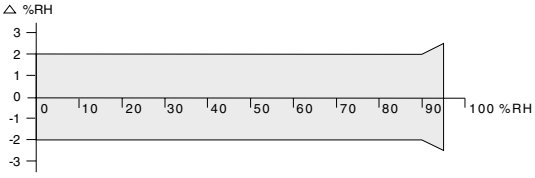
Duct mount	RH only	HMD70U
	RH & T	HMD70Y
	T only	HMD70T

Relative Humidity

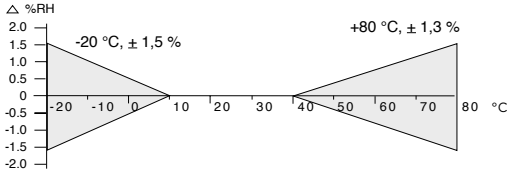
Measurement range

duct mount 0 ... 100 %RH*

Accuracy at +20 °C



Temperature dependence



Response time at +20 °C (+68 °F),

90% response 15 s (with membrane filter)

Stability ± 2 %RH / 2 years

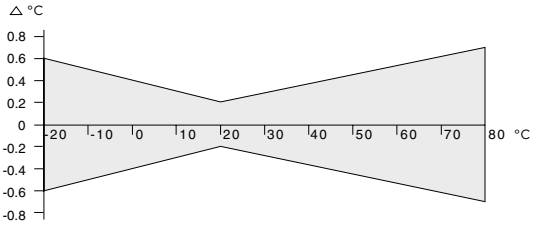
Temperature (Y and T Models)

Linearity better than 0.1 °C

Sensor Pt 1000 RTD Class F0.3 IEC 60751

Measurement range -20 ... +80 °C (-4 ... 176 °F) **

Accuracy



** Optional temperature scales are available on request.

General - 60 Series

Supply voltage	10 ... 35 VDC (RL = 0 ohm)
	20 ... 35 VDC (RL = 500 ohm)
Output signal	4 ... 20 mA

General - 70 Series

Supply voltage range depends on the selected output signal

	DC	AC
0 ... 1 V	10 ... 35 V	9 ... 24 V
0 ... 5 V	14 ... 35 V	12 ... 24 V
0 ... 10 V	19 ... 35 V	16 ... 24 V
WITH OPTIONAL CURRENT MODULE		
0 ... 20 mA (RL = 0 ohm)	10 ... 35 V	11 ... 24 V
**0 ... 20 mA (RL = 500 ohm)	20 ... 35 V	17 ... 24 V

Power consumption @ 24 VAC

HMD70U 10 mA typical

HMD70Y 12 mA typical

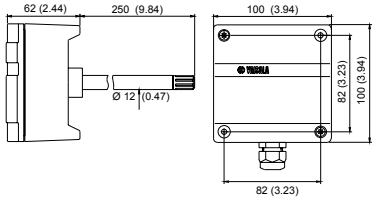
General

Operating temperature range	
electronics	-5 ... +55 °C (+23 ... +131 °F)
probe	-20 ... +80 °C (-4 ... +176 °F)
Storage temperature range	-40 ... +80 °C (-40 ... +176 °F)
Maximum flow speed	50 m/s
Current module	part no. 18945 HM
Housing	
probe	stainless steel
electronics	cast aluminum
Connections	screw terminals 0.5 ... 1.5 mm^2
Sensor protection	
standard	membrane filter (part no. DRW010525)
optional	stainless steel sintered filter (part no. HM46670SP)
Cable thread-through	
bushing for 7 ... 10 mm (PG9)	
cable housing IP65 (NEMA 4)	part no. 18941HM
armoured cable glands	part no. 10528HM
(must be ordered separately)	

Complies with EMC standard EN61326 and EN55022

Dimensions

Dimensions in mm (inches)



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HMDW110 Series Humidity and Temperature Transmitters for High-Accuracy Measurements in HVAC Applications

HMDW110 Series Humidity and Temperature Transmitters for measurements in ducts, outdoor environments, and humid areas.

Vaisala HUMICAP® Humidity and Temperature Transmitter Series HMDW110 measure relative humidity and temperature in multiple HVAC applications. The series includes transmitters for duct mounting, IP65-classified wall transmitters, and outdoor transmitters with integrated radiation shields.

Proven Vaisala HUMICAP® Performance

The cost-efficient HMDW110 series transmitters are equipped with trusted HUMICAP® 180R sensors. The sensor's superior long-term stability minimizes maintenance needs throughout the transmitter's lifetime. If necessary, the transmitter can be field-calibrated using either an HM70 Hand-Held Humidity and Temperature Meter, or a PC connection.

HMDW110 series instruments are individually adjusted and delivered with a calibration certificate. The factory calibration is traceable to NIST.

Unrivaled Outdoor Humidity Measurements

The integrated radiation shield of the outdoor models HMS110 and HMS112 enables unrivaled measurement performance. It reduces the impact of sunshine on temperature and humidity measurements, and ensures measurement accuracy in outdoor conditions. The most popular control parameters in free cooling – dew point temperature, wet bulb temperature, and enthalpy – are available as output parameters.

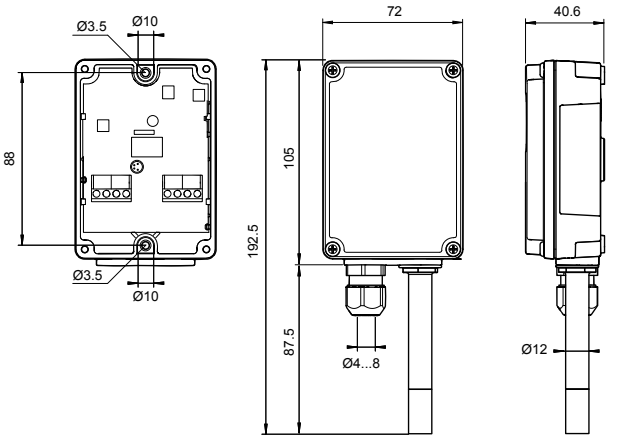
Features/Benefits

- Accurate humidity and temperature transmitters for measurements in HVAC and cleanroom applications
- Outdoor transmitter with professional-grade radiation shield
- Proven HUMICAP® 180R sensor for superior long-term stability
- ±2 %RH accuracy
- 3-point NIST traceable calibration (certificate included)
- On-site calibration with HM70 Hand-Held Meter or PC connection
- Current output (4 ... 20 mA)
- Default output parameters are relative humidity and temperature. Dew point temperature, wet bulb temperature, and enthalpy outputs selectable with a PC connection.

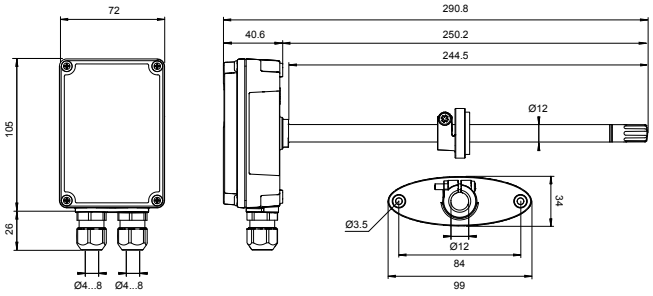
Well-Suited for Cleanroom Monitoring

The HMD110 and HMW110 transmitters can be ordered with a catalytic HUMICAP® sensor HUMICAP® 180VHP. The catalytic sensor improves stability especially in hydrogen peroxide sterilized environments where repeated condensation is expected.

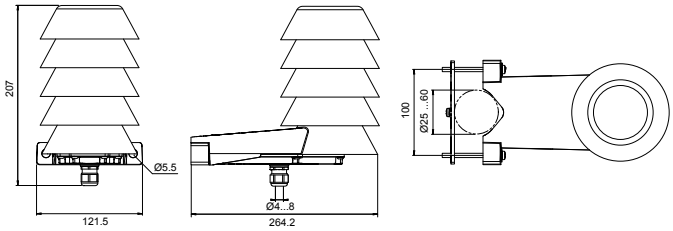
An optional panel display can be added for remote monitoring. Transmitters can be installed into difficult-to-reach locations, while measurement data can be read from a more convenient spot.



HMW110/112
RH+T transmitters for measurements in wet areas



HMD110/112
RH+T transmitters for ducts



HMS110/112
RH+T transmitters for outdoor measurements

Technical Data

Models

Model number	Type	Output	Special Features	Ingress Protection
HMW110	Wall-mount, RH+T	2-wire, current output	Configurable model*	IP65
HMW112	Wall-mount, RH+T	2-wire, current output		IP65
HMD110	Duct-mount, RH+T	2-wire, current output	Configurable model*	IP65
HMD112	Duct-mount, RH+T	2-wire, current output		IP65
HMS110	Outdoor, RH+T	2-wire, current output	Radiation shield, configurable model*	IP65
HMS112	Outdoor, RH+T	2-wire, current output	Radiation shield	IP65

*Delivered with customer specific output settings, including calculated humidity parameters and special scaling of outputs.

Performance

RELATIVE HUMIDITY	
Measurement range	0 ... 100 %RH
Accuracy	
Temperature range	+10 ... +30 °C (+50 ... +86 °F)
0 ... 90 %RH	±2 %RH
90 ... 100 %RH	±3 %RH
Temperature range	-20 ... +10 °C, +30 ... +60 °C (-4 ... +50 °F, +86 ... +140 °F)
0 … 90 %RH	±3 %RH
90 … 100 %RH	±4 %RH
Temperature range	-40 ... -20 °C (-40 ... -4 °F)
0 ... 100%RH	±4 %RH
Stability in typical HVAC applications	±0.5 %RH/year
Humidity sensor	Vaisala HUMICAP® 180R
TEMPERATURE	
Measurement range	-40 ... +60 °C (-40 ... +140 °F)
Accuracy	
At +20 °C (+68 °F)	±0.3 °C
Temperature dependence	±0.01 °C/°C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
CALCULATED PARAMETERS	
Measurement range for dew point temperature and wet bulb temperature	-40 ... +60 °C (-40 ... +140 °F)
Measurement range for enthalpy	-40 ... 460 kJ/kg (-10 ... +190 BTU/lb)
Accuracy of the calculated parameters should be calculated at the actual condition based on the RH and temperature specification.	
Accuracy at 20°C (68°F) and 80%RH:	
Dew point	±0.7 °C (1.2 °F)
Wet bulb temperature	±0.5 °C (0.9 °F)
Enthalpy	±1.6kJ/kg (0.7 BTU/lb)

Operating Environment (All Models)

Operating temperature range	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity range	0 ... 100 %RH
Maximum wind/flow speed	30 m/s
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
Electromagnetic compliance	EN61326-1, Industrial Environment

Mechanics

Max wire size	1.5 mm^2 (AWG 16)
Standard housing color	White (RAL9003)
Housing material	PC + 10%GF (UL-V0 approved)

Inputs and Outputs

Analog output	4 ... 20 mA, loop powered
Loop resistance	0 ... 600 Ω
Supply voltage	20 ... 28VDC at 600 Ω load
	10 ... 28VDC at 0 Ω load
Data input for RDP100 Remote Panel Display	RS485, Vaisala proprietary protocol

Spare Parts and Accessories

Remote Panel Display	RDP100
Conduit fitting + O-ring (M16x1.5 / NPT1/2 Inch)	210675SP
Conduit fitting + O-ring (M16x1.5 / PG9, RE-MS)	210674SP
Fastening set HMS110	237805
Porous PTFE Filter	DRW239993SP
Membrane Filter	ASM210856SP
Terminal Block, Blue	236620SP
USB cable for PC connection	219690
Connection cable for HM70 hand-held meter	219980SP
HUMICAP® 180R sensor	HUMICAP180R
Catalytic HUMICAP® sensor	HUMICAP180VHP

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HMS110 Series Humidity and Temperature Transmitters for High-Accuracy Outdoor Measurements in Building Automation Applications

HMS110 Series Humidity and Temperature Transmitters with HUMICAP® sensor.

Features/Benefits

- Reliable outdoor transmitters with integrated radiation shields
- ±2 %RH accuracy
- Proven HUMICAP® 180R sensor for long-lasting accuracy
- 3-point NIST traceable calibration (certificate included)
- Default output parameters are relative humidity and temperature. Dew point temperature, wet bulb temperature, and enthalpy outputs selectable with a PC connection.
- Current output (4...20 mA)
- On-site calibration with HM70 Hand-Held Meter or PC connection
- Ingress protection IP65

Vaisala HUMICAP® Humidity and Temperature Transmitter Series HMS110 are designed for demanding outdoor measurements in building automation applications. These ±2% transmitters include an integrated radiation shield to reduce the influence of solar radiation on temperature and humidity measurements.

Proven Vaisala HUMICAP® Performance for Outdoor Measurements

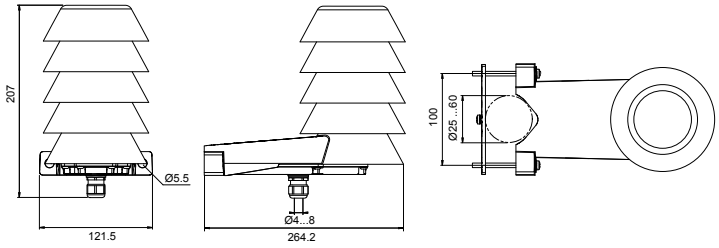
HMS110 transmitters are equipped with the trusted HUMICAP® 180R – a robust, general-purpose humidity sensor that functions well in high humidity. The sensor's superior stability ensures long-lasting accuracy and minimal maintenance throughout the transmitter's lifetime.

The integrated radiation shield allows unrivaled measurement performance, reducing the impact of sunshine on temperature and humidity measurements and ensuring measurement accuracy in outdoor conditions.

Easy Installation and Maintenance

HMS110 transmitters are easy to install. They can be mounted directly onto a wall or pole without any extra accessories. There are no loose parts, screws are retained in the enclosure, all connectors are clearly labeled, and the connectors are within easy reach.

The HUMICAP® sensor's excellent long-term stability and high-quality materials ensure minimal need for maintenance. If necessary, the transmitter can be field-calibrated using either an HM70 Hand-Held Humidity and Temperature Meter, or a PC connection.



Technical Data

Models

MODEL NUMBER	TYPE	OUTPUT	SPECIAL FEATURES	INGRESS PROTECTION
HMS110	Outdoor, RH+T	2-wire, current output	Delivered with customer specific output settings, including calculated humidity parameters and special scaling of outputs.	IP65
HMS112	Outdoor, RH+T	2-wire, current output		IP65

Performance

RELATIVE HUMIDITY	
Measurement range	0 ... 100 %RH
Accuracy	
Temperature range	+10 ... +30 °C (+50 ... +86 °F)
0 ... 90 %RH	±2 %RH
90 … 100 %RH	±3 %RH
Temperature range	-20 ... +10° C, +30 ... +60 °C (-4 ... +50 °F, +86 ... +140 °F)
0 … 90 %RH	±3 %RH
90 … 100 %RH	±4 %RH
Temperature range	-40 ... -20 °C (-40 ... -4 °F)
0 ... 100%RH	±4 %RH
Stability in typical HVAC applications	±0.5 %RH/year
Humidity sensor	Vaisala HUMICAP® 180R
TEMPERATURE	
Measurement range	-40 ... +60 °C (-40 ... +140 °F)
Accuracy	
At +20 °C (+68 °F)	±0.3 °C (±0.54 °F)
Temperature dependence	±0.01 °C/ °C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
CALCULATED PARAMETERS	
Measurement range for dew point temperature and wet bulb temperature	-40 ... +60 °C (-40 ... +140 °F)
Measurement range for enthalpy	-40 ... 460 kJ/kg (-10 ... +190 BTU/lb)
Accuracy of the calculated parameters should be calculated at the actual condition based on the RH and temperature specification. Accuracy at 20°C (68°F) and 80%RH:	
Dew point	±0.7°C (1.2°F)
Wet bulb temperature	±0.5°C (0.9°F)
Enthalpy	±1.6kJ/kg (0.7 BTU/lb

Operating Environment

Operating temperature range	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity range	0 ... 100 %RH
Maximum wind/flow speed	30 m/s
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
Electromagnetic compliance	EN61326-1, Industrial Environment

Mechanics

Max wire size	1.5 mm² (AWG 16)
Standard housing color	White (RAL9003)
Housing material	PC + 10%GF (UL-V0 approved)

Inputs and Outputs

Analog output	4 ... 20 mA, loop powered
Loop resistance	0 ... 600 Ω
Supply voltage	20 ... 28VDC at 600 Ω load 10 ... 28VDC at 0 Ω load
Data input for RDP100 Remote Panel Display	RS485, Vaisala proprietary protocol

Spare Parts and Accessories

Remote Panel Display	RDP100
Conduit fitting + O-ring (M16x1.5 / NPT1/2 Inch)	210675SP
Conduit fitting + O-ring (M16x1.5 / PG9, RE-MS)	210674SP
Fastening set HMS110	237805
Membrane Filter	ASM210856SP
Terminal Block, Blue	236620SP
USB cable for PC connection	219690
Connection cable for HM70 hand-held meter	219980SP
HUMICAP® 180R sensor	HUMICAP180R

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HMDW80 Series Humidity and Temperature Transmitters for Building Automation Applications

HMDW80 Series Humidity and Temperature Transmitters for multiple applications within building automation.

Features/Benefits

- Reliable transmitters for basic HVAC humidity measurements
- ±3.0 %RH accuracy
- Full 0 ... 100 %RH measurement range
- Optimized for easy installation and low maintenance
- User exchangeable INTERCAP® sensor for easy field replacement
- Output parameters: relative humidity and temperature with optional dew point temperature, wet bulb temperature and enthalpy parameters
- UL- V0 flammability rating

Typical Installation Locations

- Ventilation ducts
- Walls
- Wash-down areas
- Outdoor locations

Vaisala INTERCAP® Humidity and Temperature Transmitter Series HMDW80 measure relative humidity and temperature in various building automation applications. Transmitters combine easy installation and reliable operation with a low requirement for maintenance.

The versatile HMDW80 series includes transmitters for wall and duct mounting, IP65-classified transmitters for humid areas, and transmitters with a radiation shield for outdoor use. It also includes temperature-only transmitters and transmitters with an optional display.

Calculated humidity parameters – dew point temperature, wet bulb temperature, and enthalpy – are also available.

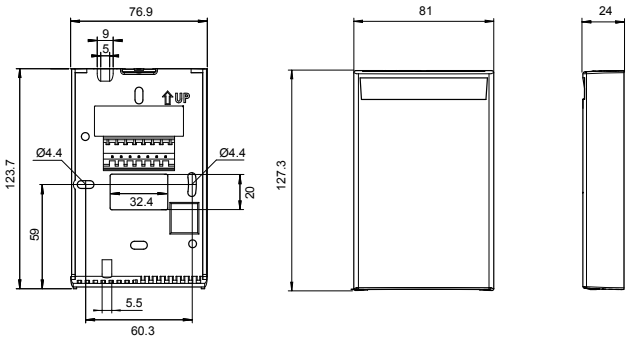
Easy Installation

HMDW80 series transmitters are optimized for easy installation. There are no loose parts, screws are retained in the enclosure, all connectors are clearly labeled, and the connectors are within easy reach.

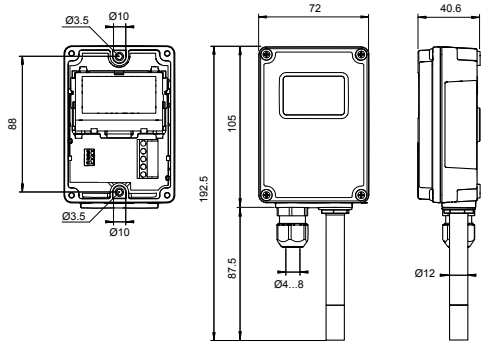
The duct mount transmitters are well suited to a variety of duct sizes, the outdoor transmitters can be mounted directly onto a wall or pole without any extra accessories, and the wall mount transmitters can be installed without the need to make holes in the transmitter enclosure.

Reliable Operation

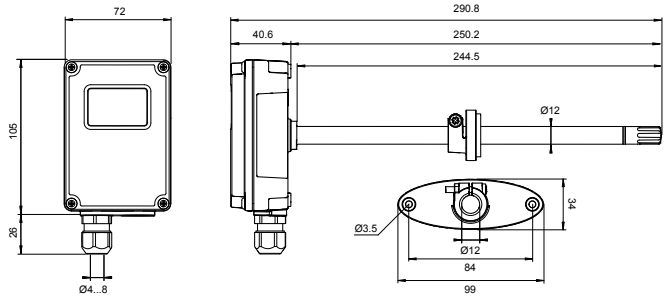
HMDW80 series transmitters require minimal maintenance thanks to their excellent sensor stability and high-quality materials. If necessary, the INTERCAP® sensor can be easily exchanged in the field with minimum downtime.



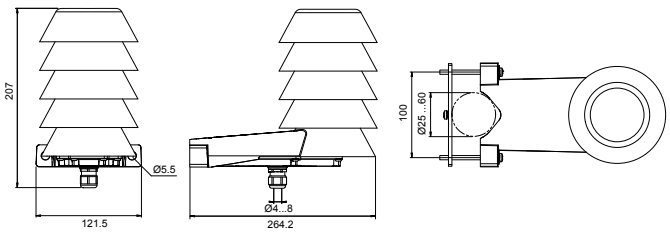
HMW82/83 RH+T and TMW82/83 T-only transmitters for wall-mounting



HMW88/89(D) RH+T transmitters for measurements in wet areas



HMD82/83(D) and TMD82/83 RH+T and T-only transmitters for ducts



HMS82/83 RH+T transmitters for outdoor measurements

Technical Data

Models

Model number	Type	Output	Special Features	Ingress Protection
TMW82	Wall-mount, T-only	2-wire, current output		IP30
TMW83	Wall-mount, T-only	3-wire, voltage output		IP30
HMW82	Wall-mount, RH+T	2-wire, current output		IP30
HMW83	Wall-mount, RH+T	3-wire, voltage output		IP30
HMW88	Wall-mount, RH+T	2-wire, current output	Calculated parameters*	IP65
HMW88D	Wall-mount, RH+T	2-wire, current output	Display, calculated parameters*	IP65
HMW89	Wall-mount, RH+T	3-wire, voltage output	Calculated parameters*	IP65
HMW89D	Wall-mount, RH+T	3-wire, voltage output	Display, calculated parameters*	IP65
TMD82	Duct-mount, T-only	2-wire, current output		IP65
TMD83	Duct-mount, T-only	3-wire, voltage output		IP65
HMD82	Duct-mount, RH+T	2-wire, current output	Calculated parameters*	IP65
HMD82D	Duct-mount, RH+T	2-wire, current output	Display, calculated parameters*	IP65
HMD83	Duct-mount, RH+T	3-wire, voltage output	Calculated parameters*	IP65
HMD83D	Duct-mount, RH+T	3-wire, voltage output	Display, calculated parameters*	IP65
HMS82	Outdoor, RH+T	2-wire, current output	Radiation shield, calculated parameters*	IP65
HMS83	Outdoor, RH+T	3-wire, voltage output	Radiation shield, calculated parameters*	IP65

*Output parameters for humidity: relative humidity, dew point temperature, wet bulb temperature, and enthalpy.

Specifications for Models HMW82/83 and TMW82/83

Performance

Operating temperature range	-5 ... +55 °C (+23 ... +131 °F)
Operating humidity range	0 … 100 %RH, non-condensing
RELATIVE HUMIDITY	
Measurement range	0 ... 100 %RH
Accuracy	
Temperature range	+10 ... +30 °C (+50 ... +86 °F)
0 ... 70 %RH	±3 %RH
70 ... 100 %RH	±5 %RH
Temperature range	-5 ... +10 °C, +30 ... + 55 °C (+23 ... +50 °F, +86 ... +131 °F)
0 …100 %RH	±7 %RH
Stability in typical HVAC applications	±2 %RH over 2 years
Humidity sensor	Vaisala INTERCAP®
TEMPERATURE	
Measurement range	-5 ... +55 °C (+23 ... +131 °F)
Accuracy	
+10 ... +30 °C (+50 °F ... +86 °F)	±0.5 °C (±0.9 °F)
-5 ... +10 °C, +30 ... +55 °C (+23 ... +50 °F, +86 ... +131 °F)	±1.0 °C (±1.8 °F)
Temperature sensor	Digital temperature sensor

Specifications for Models HMD82/83, TMD82/83, HMW88/89, and HMS82/83

Performance

Operating temperature range	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity range	0 ... 100 %RH
RELATIVE HUMIDITY	
Measurement range	0 ... 100 %RH
Accuracy	
Temperature range	+10 ... +30 °C (+50 ... +86 °F)
0 ... 90 %RH	±3 %RH
90 … 100 %RH	±5 %RH
Temperature range	-20 ... +10° C, +30 ... +60 °C (-4 ... +50 °F, +86 ... +140 °F)
0 … 90 %RH	±5 %RH
90 … 100 %RH	±7 %RH
Temperature range	-40 ... -20 °C (-40 ... -4 °F)
0 ... 100%RH	±7 %RH
Stability in typical HVAC applications	±2 %RH over 2 years
Humidity sensor	Vaisala INTERCAP®
TEMPERATURE	
Measurement range	-40 ... +60 °C (-40 ... +140 °F)
Accuracy	
At +20 °C (+68 °F)	±0.3 °C (±0.54 °F)
Temperature dependence	±0.01 °C/ °C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
CALCULATED PARAMETERS	
Measurement range for dew point temperature and wet bulb temperature	-40 ... +60 °C (-40 ... +140 °F)
Measurement range for enthalpy	-40 ... 460 kJ/kg (-10 ... +190 BTU/lb)

Specifications for Models HMD82/83D and HMW88/89D

Performance

Operating temperature range	-5 … +60 °C (+23 … +140 °F)
Operating humidity range	0…100 %RH, non-condensing
RELATIVE HUMIDITY	
Measurement range	0 … 100 %RH
Accuracy	
Temperature range	+10 ... +30 °C (+50 ... +86 °F)
0 ... 90 %RH	±3 %RH
90 … 100 %RH	±5 %RH
Temperature range	-5 ... +10 °C, +30 ... +60 °C (+23 ... +50 °F, +86 ... +140 °F)
0 … 90 %RH	±5 %RH
90 … 100 %RH	±7 %RH
Stability in typical HVAC applications	±2 %RH over 2 years
Humidity sensor	Vaisala INTERCAP®
TEMPERATURE	
Measurement range	(Analog output scaling) -40 ... +60 °C (-40 ... +140 °F)
Operating temperature range of the display	+5 ... +60 °C (+23 ... +140 °F)
Accuracy	
At +20 °C (+68 °F)	±0.3 °C (±0.54 °F)
Temperature dependence	±0.01 °C/ °C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
CALCULATED PARAMETERS	
Measurement range for dew point temperature and wet bulb temperature	-40 ... +60 °C (-40 ... +140 °F)
Measurement range for enthalpy	-40…460 kJ/kg (-10…+190 BTU/lb)

Operating Environment (All Models)

Operating Environment (All Models)	See model specifications
Maximum wind/flow speed	30 m/s
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
Electromagnetic compliance	EN61326-1, Industrial Environment

Mechanics

Max wire size	1.5 mm² (AWG 16)
Standard housing color	White (RAL9003)
Housing material	
HMW82/83, TMW82/83	ABS/PC (UL-V0 approved)
HMW88/89(D), HMD82/83(D), TMD82/83, HMS82/83	PC + 10%GF (UL-V0 approved)

Inputs and Outputs

Current output models (2-wire)	
Outputs	4 ... 20 mA, loop powered
Loop resistance	0 ... 600 Ω
Supply voltage	20 ... 28VDC at 600 Ω load 10 ... 28VDC at 0 Ω load
Voltage output models (3-wire)	
Outputs	0...10 V
Load resistance	10 kΩ min
Supply voltage	18 ... 35 VDC 24 VAC ±20 % 50/60 Hz

Spare Parts and Accessories

INTERCAP® sensor	15778HM
10 pcs of INTERCAP® sensors	INTERCAPSET-10PCS
Conduit fitting + O-ring (M16x1.5 / NPT1/2 Inch)	210675SP
Conduit fitting + O-ring (M16x1.5 / PG9, RE-MS)	210674SP
Fastening set HMS80	237805
Porous PTFE Filter	DRW239993SP
Membrane Filter	ASM210856SP
Terminal Block, Blue	236620SP
HMD80 display lid	ASM210793SP

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HMS80 Series Humidity and Temperature Transmitters for Outdoor Measurements in Building Automation Applications

HMS80 Series Humidity and Temperature Transmitters with integrated radiation shields.

Features/Benefits

- Reliable outdoor transmitters with integrated radiation shields
- ±3 %RH accuracy
- User-exchangeable INTERCAP® sensor for easy field replacement
- Default output parameters are relative humidity and temperature. Dew point temperature, wet bulb temperature, and enthalpy outputs selectable using dip switches.
- Options for both current and voltage outputs
- Ingress protection IP65

Vaisala INTERCAP® Humidity and Temperature Transmitter Series HMS80 are designed for outdoor measurements in various building automation applications. These ±3% transmitters include an integrated radiation shield to reduce the influence of solar radiation on temperature and humidity measurements.

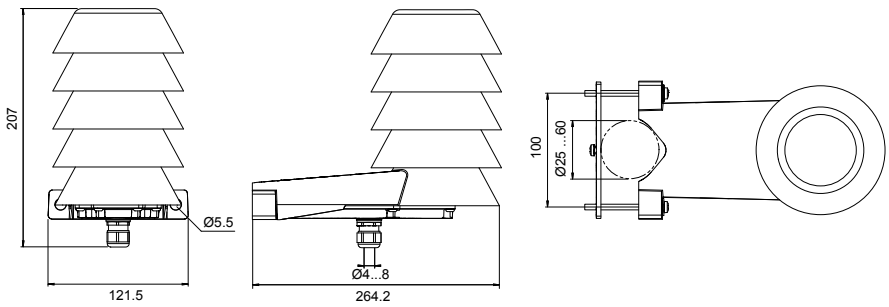
For fast and convenient configuration, the most popular control parameters in free cooling control – dew point temperature, wet bulb temperature, and enthalpy – are selectable using dip switches.

Low Maintenance

HMS80 series transmitters require minimal maintenance thanks to their excellent sensor stability and high-quality materials. If necessary, the INTERCAP® sensor can easily be replaced in the field with minimum downtime.

Easy Installation

HMS80 transmitters are easy to install. They can be mounted directly onto a wall or pole without any extra accessories. There are no loose parts, screws are retained in the enclosure, all connectors are clearly labeled, and the connectors are within easy reach.



Technical Data

Models

MODEL NUMBER	TYPE	OUTPUT	INGRESS PROTECTION
HMS82	Outdoor, RH+T	2-wire, current output	IP65
HMS83	Outdoor, RH+T	3-wire, voltage output	IP65

Performance

RELATIVE HUMIDITY	
Measurement range	0 ... 100 %RH
Accuracy	
Temperature range	+10 ... +30 °C (+50 ... +86 °F)
0 ... 90 %RH	±3 %RH
90 … 100 %RH	±5 %RH
Temperature range	-20 ... +10 °C, +30 ... +60 °C (-4 ... +50 °F, +86 ... +140 °F)
0 … 90 %RH	±5 %RH
90 … 100 %RH	±7 %RH
Temperature range	-40 ... -20 °C (-40 ... -4 °F)
0 ... 100%RH	±7 %RH
Stability in typical HVAC applications	±2 %RH over 2 years
Humidity sensor	Vaisala INTERCAP®
TEMPERATURE	
Measurement range	-40 ... +60 °C (-40 ... +140 °F)
Accuracy	
At +20 °C (+68 °F)	±0.3 °C (±0.54 °F)
Temperature dependence	±0.01 °C/ °C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
CALCULATED PARAMETERS	
Measurement range for dew point temperature and wet bulb temperature	-40 ... +60 °C (-40 ... +140 °F)
Measurement range for enthalpy	-40 ... 460 kJ/kg (-10 ... +190 BTU/lb)
Accuracy of the calculated parameters should be calculated at the actual condition based on the relative humidity and temperature specification.	
Accuracy at 20°C (68°F) and 80%RH:	
Dew point	±0.9 °C (1.6 °F)
Wet bulb temperature	±0.7 °C (1.3 °F)
Enthalpy	±2kJ/kg (0.9 BTU/lb)

Operating Environment

Operating temperature range	-40 ... +60 °C (-40 ... +140 °F)
Operating humidity range	0 ... 100 %RH
Maximum wind/flow speed	30 m/s
Storage temperature	-40 ... +60 °C (-40 ... +140 °F)
Electromagnetic compliance	EN61326-1, Industrial Environment

Mechanics

Max wire size	1.5 mm² (AWG 16)
Standard housing color	White (RAL9003)
Housing material	PC + 10%GF (UL-V0 approved)

Inputs and Outputs

Current output model HMS82 (2-wire)	
Outputs	4 ... 20 mA, loop powered
Loop resistance	0 ... 600 Ω
Supply voltage	20 ... 28VDC at 600 Ω load 10 ... 28VDC at 0 Ω load
Voltage output model HMS83 (3-wire)	
Outputs	0...10 V
Load resistance	10 kΩ min
Supply voltage	18 ... 35 VDC 24 VAC ±20 % 50/60 Hz

Spare Parts and Accessories

INTERCAP® sensor	15778HM
10 pcs of INTERCAP® sensors	INTERCAPSET-10PCS
Conduit fitting + O-ring (M16x1.5 / NPT1/2 Inch)	210675SP
Conduit fitting + O-ring (M16x1.5 / PG9, RE-MS)	210674SP
Fastening set HMS80	237805
Membrane Filter	ASM210856SP
Terminal Block, Blue	236620SP

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HMM100 Humidity Module for Environmental Chambers

The Vaisala HUMICAP® Humidity Module HMM100.

Features/Benefits

- Full temperature compensation over the operating temperature range of -70 °C ... +180 °C
- High temperature tolerance, also suitable for heat-sterilization
- Excellent measurement accuracy with Vaisala HUMICAP® 180R sensor
- Durable
- Easy field calibration by trimmers
- Maintenance-free
- Easy to install
- Applications: test chambers, incubators

The Vaisala HUMICAP® Humidity Module HMM100 is an open frame module for integration into environmental chambers. The modules provide a single analog output channel for relative humidity (RH) or dew point (T_d).

Two probes are available, one made of plastics, the other of stainless steel. Several cable lengths up to 3 meters are available. Both the probes have the Vaisala HUMICAP® 180R sensor which ensures excellent measurement accuracy.

Robust and Reliable

The HMM100 probe works in freezing conditions (-70 °C) and also in temperatures up to +180 °C. The HMM100 is easy to install and the probe can be freely placed in a test chamber as the speed of airflow does not affect the measurement.

Maintenance-free

Compared to psychrometers, the HMM100 is practically maintenance-free. There is no wick that needs changing and there is no need for a water tank or water pump. Thus, environmental stress screening can be done reliably.

Accessories

The accessories available are a component board mounting bracket with a lid, probe clamp, USB-cable for service use, a module housing and a probe mounting flange.

Technical Data

Performance

RELATIVE HUMIDITY	
Measurement range	0 ... 100 %RH
Accuracy (incl. non-linearity, hysteresis and repeatability)	
temperature range	-20 ... +40 °C
0 ... 90 %RH	±2 %RH
90 ... 100 %RH	±3 %RH
temperature range	-40 ... -20 °C, +40 ... +180 °C
0 ... 90 %RH	±2.5 %RH
90 ... 100 %RH	±3.5 %RH
Factory calibration uncertainty (+20 °C)	±1.5 %RH
Humidity sensor	Vaisala HUMICAP® 180R
DEW POINT TEMPERATURE	
Measurement range	-20 ... +100 °C (-4 ... +212 °F)T_d
Accuracy (incl. non-linearity, hysteresis and repeatability when dew point depression <20 °C (Ambient temperature - dew point)	±2 °C T_d

Operating Environment

Operating temperature range	
component board	-5 ... +55 °C (+23 ... +131 °F)
stainless steel and plastic probe	-70 ... +180 °C (-94 ... +356 °F)
porous PTFE filter stainless steel, sintered filter	-70 ... +180 °C (-94 ... +356 °F)
plastic grid, membrane filter	-20 ... +80 °C (-4 ... +176 °F)
Electromagnetic compatibility	Applicable parts of EN61326-1, Generic Environment

Input and Outputs

Operating voltage	
2-wire model	24 VDC
3-wire model	10 ... 35 VDC or 9 ... 24 VAC 15 ... 35 VDC or 14 ... 24 VAC when 0 ... 10 V output is used
Power consumption	6 mA
Analog output types (1 output selectable)	
2-wire model	4 ... 20 mA (loop-powered)
3-wire model	0 ... 20 mA, 0 ... 1 V/5 V/10 V
Max. wire size	0.5 ... 1. 5 mm^2 (AWG)
Service port	M8 connector for USB cable

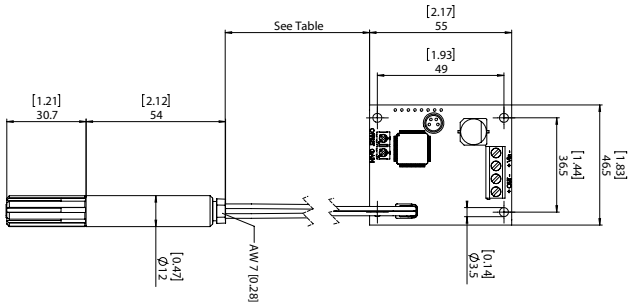
Mechanics

Service cable connector	M8 series 4-pin (male)
Probe diameter	12 mm
Probe cable lengths	0.6/1.55/2.9 m
Probe material	
plastics	PPS
stainless steel	AISI316/PPS
Probe mounting clamp	AISI316
Mounting bracket material	
lid	ABS/PC
bottom plate	Al
Module housing material	ABS/PC (cover)

Options and Accessories

Humidity sensor	HUMICAP180R
Membrane filter	10159HM
Plastic grid filter	6221
Porous PTFE filter	219452SP
Stainless steel sintered filter	HM47280SP
Mounting bracket with lid	225979
Module housing (IP65)	226060
Probe mounting flange	226061
Probe mounting clamp set (10 pcs)	226067
USB cable	226068

Dimensions



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Vaisala INTERCAP® Humidity and Temperature Probe HMP60

The HMP60 for extreme conditions.

Features/Benefits

- Miniature-size humidity probe
- Low power consumption
- Measurement range: 0 ... 100 %RH; -40 ... +60°C
- Cable detachable with standard M8 connector
- Rugged metal housing
- Interchangeable Vaisala INTERCAP® Sensor
- Optional RS485 digital output

  Optional dew point output
- Applications: volume applications, integration into other manufacturers' equipment, glove boxes, greenhouses, fermentation chambers, data loggers

HMP60

The HMP60 is a simple, durable and cost-effective humidity probe. It is suitable for volume applications, integration into other manufacturers' equipment, incubators, glove boxes, greenhouses, fermentation chambers, and data loggers.

Easy Installation

The probe cable has a screw-on quick connector for easy installation. Different cable lengths are available. Also other compatible M8 series cables can be used. Accessories are available for different installation needs.

Low Current Consumption

The HMP60 is suitable for battery-powered applications because of its very low current consumption.

Several Outputs

There are two configurable voltage outputs with relative humidity, temperature or dew point scaling. Four voltage output ranges are available.

Rugged Design

The HMP60 is designed for extreme conditions. The stainless steel body of the HMP60 is classified as IP65. The probe has a sealed structure and the sensor is protected by a membrane filter and a plastic grid, or optionally by a stainless steel filter.

Recalibration Not Needed

The Vaisala INTERCAP® Sensor is interchangeable. No recalibration is required; the sensor can simply be replaced, also in the field.

Technical Data

Performance

RELATIVE HUMIDITY	
Measurement range	0 ... 100 %RH
Typical accuracy	
temperature range	0 ... +40 °C
0 ... 90 %RH	±3 %RH
90 ... 100 %RH	±5 %RH
temperature range	-40 ... 0 °C, +40 ... +60 °C
0 ... 90 %RH	±5 %RH
90 ... 100 %RH	±7 %RH
Humidity sensor	Vaisala INTERCAP®
TEMPERATURE	
Measurement range	-40 ... +60 °C
Accuracy over temperature range	
+10 ... +30 °C	±0.5 °C
-40 ... +10, +30 ... +60 °C	±0.6 °C
DEW POINT	
Measurement range	-40 ... +60 °C
Typical accuracy	
temperature range	0 ... +40 °C
when dew point depression < 15 °C	±2 °C
temperature range	-40 ... 0 °C, +40 ... +60 °C
when dew point depression < 10 °C	±3 °C
dew point depression = ambient temperature - dew point	

Inputs and Outputs

Operating voltage	5 ... 28 VDC / 8 ... 28 VDC with 5 V output
(Use lowest available operating voltage to minimize heating.)	8 ... 28VDC with loop power converter
Current consumption	1 mA average, max. peak 5 mA
Start-up time	
probes with analog output	4 s at operating voltage 13.5 ... 16.5 VDC 2 s at other valid operating voltages
probes with digital output	1 s
Outputs	
2 channels	0 ... 1 VDC/0 ... 2.5 VDC / 0 ... 5 VDC/1 ... 5 VDC
1-channel loop-power converter (separate module, compatible with humidity accuracy only)	4 ... 20 mA
digital output (optional)	RS485 2-wire half duplex
External loads	
0 ... 1 V	R_L min 10 kΩ
0 ... 2.5 V /0 ... 5 V	R_L min 50 kΩ

Operating Environment

Operating temperature	-40 ... +60 °C
Electromagnetic compatibility	EN 61326-1: Electrical equipment for measurement, control and laboratory use – EMC requirements – for use in industrial locations.

Mechanics

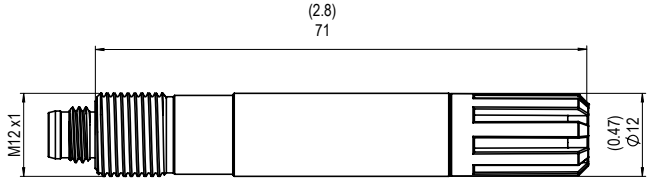
Materials	
body	stainless steel (AISI 316)
grid filter	chrome coated ABS plastic
cable	polyurethane or FEP
Housing classification	IP65
Body thread	MI2x1 / 10 mm
Cable connector	4-pin M8 (IEC 60947-5-2)
Weight	
probe	17 g
probe with 0.3 m cable	28 g

Options and Accessories

Vaisala INTERCAP® Sensor, 1 piece	15778HM
Vaisala INTERCAP® Sensor, 10 pcs	INTERCAPSET-10PCS
Sensor protection	
plastic grid	DRW010522
membrane filter	DRW010525
stainless steel sintered filter	HM46670SP
4 ... 20mA loop power converter	UI-CONVERTER-1CB
Mounting bracket for converter	225979
Plastic M12 installation nuts, pair	18350SP
USB cable for PC connection	219690
Probe mounting clamp set, 10 pcs	226067
Probe mounting flange	226061
Connection cables	
0.3 m PU	HMP50Z032SP
3 m PU	HMP50Z300SP
180 °C 3 m FEP	226902SP

Dimensions

in mm (inches)



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Vaisala HUMICAP® Humidity and Temperature Probe HMP110

The HMP110 with excellent stability and high chemical tolerance.

Features/Benefits

- Miniature-size humidity transmitter
- Low power consumption and fast start-up for battery powered applications
- Measurement range: 0 ... 100 %RH; -40 ... +80°C
- Cable detachable with standard M8 quick connector
- Reliable: Latest generation HUMICAP® 180R sensor for best stability and high chemical tolerance. IP65 metal housing.
- Optional RS485 digital output
- Traceable: Comes with calibration certificate. ±1.5 %RH measurement accuracy (0 ... 90 %RH)
- HMP110R replacement probe service available for easy maintenance
- Optional dew point calculation

The HMP110 is a trouble-free and cost-effective humidity transmitter with high accuracy and good stability. It is suitable for volume applications or integration into other manufacturers' equipment. The HMP110 is also suitable for glove boxes, greenhouses, fermentation and stability chambers, data loggers, and incubators.

Easy Installation

The probe cable has a screw-on quick connector for easy installation. Different cable lengths and accessories are available.

Low Current Consumption

HMP110 is suitable for battery-powered applications because of its very low current consumption. It also has a fast start-up time.

Several Outputs

The temperature measurement is a standard feature, dew point measurement is optional. Three standard voltage outputs are available.

Robust Design

The stainless steel body of the HMP110 is classified as IP65. Thus, it survives rough conditions. The HMP110 has high chemical tolerance because of the HUMICAP® 180R sensor.

Easy Maintenance

Maintaining measurement traceability is easy using the HMP110R replacement probe. We send you a replacement probe, you detach the old probe and send it back to us. In this way the measurement is available at all times without interruptions.

Technical Data

Performance

RELATIVE HUMIDITY	
Measurement range	0 ... 100 %RH
Accuracy (incl. non-linearity, hysteresis and repeatability)	
temperature range	0 ... +40 °C
0 ... 90 %RH	±1.5 %RH
90 ... 100 %RH	±2.5 %RH
temperature range	-40 ... 0 °C, +40 ... +80 °C
0 ... 90 %RH	±3.0 %RH
90 ... 100 %RH	±4.0 %RH
Factory calibration uncertainty (+20 °C)	
0 ... 90 %RH	±1.1 %RH
90 ... 100 %RH	±1.8 %RH
Humidity sensor	Vaisala HUMICAP® 180R
Stability	±2 %RH over 2 years
TEMPERATURE	
Measurement range	-40 ... +80 °C
Accuracy over temperature range	
0 ... +40 °C,	±0.2 °C
-40 ... 0 °C, +40 ... +80 °C	±0.4 °C
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751
DEW POINT	
Measurement range	-40 ... +80 °C
Accuracy (incl. non-linearity, hysteresis and repeatability)	
temperature range	0 ... +40 °C
when dew point depression < 15 °C	±1 °C
when dew point depression 15 ... 25 °C	±2 °C
temperature range	-40 ... 0 °C, +40 ... +80 °C
when dew point depression < 15 °C - dew point depression = ambient temperature - dew point	±2 °C

Inputs and Outputs

Operating voltage	5 ... 28 VDC / 8 ... 28 VDC with 5 V output
(Use lowest available operating voltage to minimize heating)	8 ... 28 VDC with loop power converter
Current consumption	1 mA average, max. peak 5 mA
Start-up time	
probes with analog output	4 s at operating voltage 13.5 ... 16.5 VDC 2 s at other valid operating voltages
probes with digital output	1 s
Outputs	
2 channels	0 ... 1 VDC / 0 ... 2.5 VDC / 0 ... 5 VDC / 1 ... 5 VDC
1-channel loop-power converter (separate module, compatible with humidity accuracy only)	4 ... 20 mA
digital output (optional)	RS485 2-wire half duplex
External loads	
0 ... 1 V	R_L min 10 kΩ
0 ... 2.5 V /0 ... 5 V	R_L min 50 kΩ

Operating Environment

Operating temperature range	-40 ... +80 °C
Electromagnetic compatibility	EN 61326-1: Electrical equipment for measurement, control and laboratory use – EMC requirements – for use in industrial locations.

Mechanics

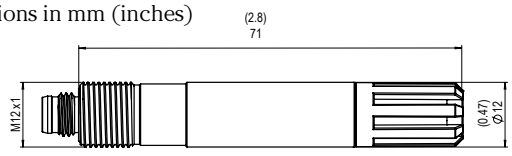
Materials	
body	stainless steel (AISI 316)
grid filter	chrome coated ABS plastic
cable	polyurethane or FEP
Housing classification	IP65
Body thread	MI2x1 / 10 mm
Cable connector	4-pin M8 (IEC 60947-5-2)
Weight	
probe	17 g
probe with 0.3 m cable	28 g

Options and Accessories

Sensor protection	
plastic grid	DRW010522SP
membrane filter	DRW010525SP
stainless steel sintered filter	HM46670SP
4 ... 20 mA loop power converter	UI-CONVERTER-1CB
Mounting bracket for converter	225979
Plastic M12 installation nuts, pair	18350SP
USB cable for PC connection	219690
Probe mounting clamp set, 10 pcs	226067
Probe mounting flange	226061
Connection cables	
standard 0.3 m	HMP50Z032SP
standard 3 m	HMP50Z300SP
80 °C 1.5 m	225777SP
80 °C 3 m	225229SP
180 °C 3 m FEP	226902SP

Dimensions

Dimensions in mm (inches)



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HM70 Hand-Held Humidity and Temperature Meter for Spot-Checking Applications

The Vaisala HUMICAP® Hand-Held Humidity and Temperature Meter HM70 is a high-performance, portable humidity reference that is exciting to use.

Features/Benefits

- Designed for spot-checking and field calibration
- Multilingual user interface
- Shows measurement trends graphically
- Proven Vaisala HUMICAP® Sensor technology
- 3 probe alternatives, temperature measurement ranges between -70 and +180 °C
- 2 probes - also dew point and CO_2 probes - can be connected simultaneously
- Displays various humidity parameters
- Sensor preheat and chemical purge options for demanding conditions
- 6-point NIST traceable calibration (certificate included)

The Vaisala HUMICAP® Hand-Held Humidity and Temperature Meter HM70 is designed for demanding humidity measurements in spot-checking applications. It is also ideal for field checking and calibration of Vaisala's fixed humidity instruments.

The HM70 incorporates the latest generation of the Vaisala HUMICAP® Sensor. It is reliable and has better than ever long-term stability. Additionally, it has a sensor that copes well with chemical interference and provides accuracy that lasts in demanding conditions.

The chemical purge option maintains measurement accuracy in environments with high concentrations of chemicals. The sensor preheat option reduces measurement delays as it keeps the sensor dry when the probe is inserted into hot and humid processes.

Three Probes to Choose from

The HMP75 is a general purpose probe whereas the HMP76 is a long, stainless steel probe especially suitable for spot-checking in ducts. The HMP77 is a small probe at the end of a 5-meter cable. The probe is ideal for difficult-to-reach areas and for on-site calibration of Vaisala's process transmitters.

In addition, the HM70 supports the use of Vaisala's dew point, carbon dioxide and moisture in oil probes, allowing measurements in several multiparameter applications.

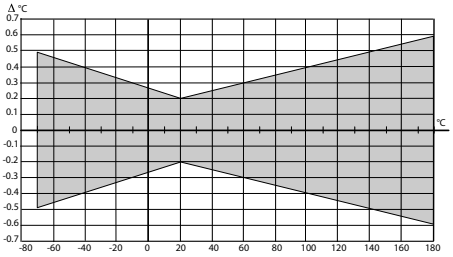
MI70 Link

The optional MI70 Link Windows® software and the USB connection cable form a practical tool for transferring logged data and real time measurement data from the HM70 to a PC.

Technical Data

HMP75, HMP76 and HMP77 Probes Measured Variables

RELATIVE HUMIDITY	
Measurement range	0 ... 100 %RH
Accuracy (including non-linearity, hysteresis and repeatability)	
at +15 ... +25 °C (+59 ... +77 °F)	±1 %RH (0 ... 90 %RH)
	±1.7 %RH (90 ... 100 %RH)
at -20 ... +40 °C (-4 ... +104 °F)	±(1.0 + 0.008 x reading) %RH
at -40 ... +180 °C (-40 ... +356 °F)	±(1.5 + 0.015 x reading) %RH
Factory calibration	±0.6 %RH (0 ... 40 %RH)
uncertainty (+20 °C / +68 °F)	±1.0 %RH (40 ... 97 %RH)
	(Defined as ±2 standard deviation limits.)
Response time (90%) at +20 °C (+68 °F) in still air	
HMP75 (with standard plastic grid)	17 s
HMP76 (with standard sintered bronze filter)	60 s
HMP77 (with standard plastic grid and stainless steel netting)	50 s
Sensor	HUMICAP® 180R
	HUMICAP® 180RC (chemical purge, sensor preheat)
Typical long-term stability	better than 1 %RH / year
TEMPERATURE	
Measurement range	
HMP75	-20 ... +60 °C (-4 ... +140 °F)
HMP76	-50 ... +120 °C (-58 ... +248 °F)
short time	-50 ... +180 °C (-58 ... +356 °F)
HMP77	-70 ... +180 °C (-94 ... +356 °F)
Accuracy at +20 °C (+68 °F)	±0.2 °C (±0.36 °F)
Accuracy over temperature range	(see graph)



Temperature sensor	Pt100 RTD Class F0.1 IEC 60751

Probe General

Operating temperature range for electronics	-40 ... +60 °C
	(-40 ... +140 °F)
Housing classification	IP65 (NEMA 4)
Housing material	ABS/PC blend
Probe material	Stainless steel (AISI316L)
Cable length between probe and indicator	1.9 m

MI70 Measurement Indicator Indicator General

Menu languages	English, Chinese, French, Spanish, German, Russian, Japanese, Swedish, Finnish
Display	LCD with backlight, graphical trend display of any parameter, character height up to 16 mm
Max. no. of probes	2
Power supply	Rechargeable NiMH battery pack with AC-adapter or 4xAA-size alkalines, type IEC LR6 0
Analog output	0... 1 VDC
Output resolution	0.6 mV
PC interface	MI70 Link software with USB or serial port cable
Data logging capacity	2700 points
Alarm	audible alarm function
Operating temperature range	-10 ... +40 °C (+14 ... +104 °F)
Operating humidity range	non-condensing
Housing classification	IP54
Battery operation time	
Continuous use	48 h typical at +20 °C (+68 °F)
Data logging use	up to a month, depending on logging interval
Electromagnetic compatibility	Complies with EMC standard EN61326-1, Portable Equipment

MI70 Indicator + Probe = HM70

ACCESSORIES	
Carrying cases	
for MI70 and HMP75/77 probe	MI70CASE3
for MI70 and HMP75/76 probe	MI70CASE4
Transmitter connection cables for	
HMT330 & HMT120/130	211339
HMT310	DRW216050
HMW90 Series, HMDW110 Series & GMW90 Series	219980
HMD/W60/70 Series	HMA6070
MI70 Link software with USB cable	219687
MI70 Link software with serial port cable	MI70LINK
Analog output cable	27168ZZ
Sensor protection HMP75	
Plastic PC grid (HMP75 standard)	6221
Membrane filter	10159HM
Sintered bronze filter	DRW212987SP
HMP76/77	
Plastic PPS grid	DRW010276SP
Sintered stainless steel filter	HM47280SP
Sintered bronze filter (HMP76 standard)	DRW212987SP
PPS grid with SS netting (HMP77 standard)	DRW010281SP

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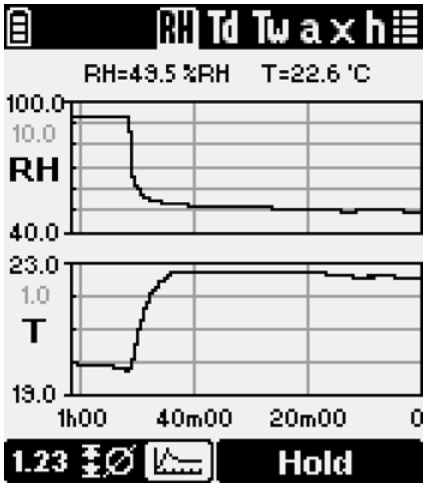
Vaisala HUMICAP® Hand-Held Humidity and Temperature Meter HM40

The HM40 Humidity Meter can be chosen either in standard or remote probe version.



The graph clearly indicates when the readings have stabilized.

The HM40 is a compact and portable humidity meter at hand everywhere you go. It is an ideal spotchecking tool that is easy to use and provides reliable measurement. It can be used for a wide range of various portable measurement applications. According to a user's needs, the meter is available in two models: standard and with a remote probe.

Simple and easy to use

The HM40 includes a user-friendly, large graphical display and easy-to-use push buttons. The user interface is simple and intuitive to use, and available in 10 languages. Also, many other settings can be modified by the user to best suit his individual needs. In addition to relative humidity and temperature, the HM40 provides five calculated humidity parameters, all available in both metric and nonmetric units.

The meter is powered by 2 AA-sized batteries. An external NiMH battery recharger with USB connection and rechargeable NiMH batteries are offered as an option. Each HM40 comes also with a handy belt clip and a case.

Easy recalibration

The calibration of the HM40 is easy: just send the meter back to a Vaisala Service Center for recalibration or simply plug in a recently calibrated interchangeable HMP113 measurement probe. Alternatively, the HM40 can be user calibrated on site using a humidity reference, e.g. the Vaisala Humidity Calibrator HMK15.

Benefits

- Compact and portable, easy to use hand-held meter
- Versatile meter with wide measurement range and multiple calculated parameters
- Standard and remote probe models available
- Ideal for spot-checking, on the go

Features

- Humidity measurement range 0 ... 100 %RH
- Operating temperature range -10 °C ... +60 °C
- Incorporates the proven Vaisala HUMICAP® 180R Sensor
- The interchangeable measurement probe HMP113 can be user calibrated
- Graphical display indicates when measurement has stabilized
- Hold-button to freeze the screen and save the reading
- Multilingual user interface with 10 languages (EN, DE, FR, JA, ZH, PT, ES, RU, FI, SV)

Technical Data

Performance

RELATIVE HUMIDITY	
Measurement range	0 ... 100 %RH
Accuracy (including non-linearity, hysteresis, and repeatability):	
at 0 ... +40 °C (+32 ... +104 °F)	±1.5 %RH (0 ... 90 %RH) ±2.5 %RH (90 ... 100 %RH)
at -10 ... 0 °C and +40 ... +60 °C (+14 ... +32 °F and +104 ... +140 °F)	±3.0 %RH (0 ... 90 %RH) ±4.0 %RH (90 ... 100 %RH)
Factory calibration uncertainty at +20 °C (+68 °F)	±1.5 %RH
Humidity measurement response time (90%) with plastic grid filter	17 s
Stability	±2 %RH over 2 years
Humidity sensor	HUMICAP® 180R
TEMPERATURE	
Measurement range	-10 ... +60 °C (14 ... 140 °F)
Accuracy over temperature range:	
at 0 ... +40 °C (+32 ... +104°F)	±0.2 °C (0.36 °F)
at -10 ... 0 °C and +40 ... +60 °C (+14 ... 32 °F and +104 ... +140 °F)	±0.4 °C (0.72 °F)
Temperature sensor	Pt1000 RTD Class F0.1 IEC 60751

Mechanics

Weight (with alkaline batteries)	
With standard probe	230 g
With handle	330 g
Materials	
Meter body	PC/ABS blend, acrylic display lens
Probe holder	PC/ABS blend (grey)
Probe	PC/ABS blend (white)
Filter	PC (glass reinforced)
Housing classification	IP54
Mechanical drop endurance	0.4 m with probe attached 1.0 m without the probe

General

Power-up time	< 3 s
Batteries	2 × AA sized, 1.5 V
Calculated parameters	Td, Tw, a, x, h
Menu languages	English, German, French, Finnish, Spanish, Swedish, Chinese (simplified), Russian, Japanese, Portuguese
Display	LCD (140 x 160 pixels)
Operation time	typical 100 hours (without backlight)
Operation temperature range	-10 ... +60 °C (+14 ... +140 °F)
Storage temperature range	-30 ... +70 °C (-22 ... +158 °F)
Electromagnetic compatibility (EMC)	European Union directive EN61326-1 for portable equipment

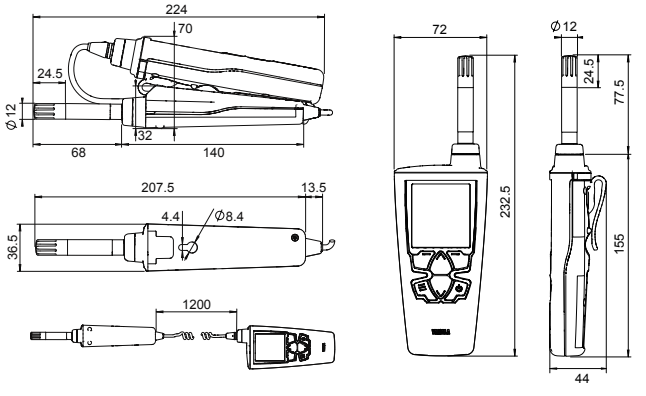
Accessories and Spare Parts

HMP113 probe for HM40*	
HM40 handle and cable	HM40HANDLE
Plastic nut for HMP113 attachment (3 pcs)	DRW238590SP
NiMH rechargeable batteries (4 pcs)	229247SP
External battery recharger with USB connection and 2 batteries	229249SP
Case for HM40 (indicator and probe)	235849SP
Plastic grid filter for HMP113 probe	DRW236214SP
Plastic grid with membrane filter for HMP113 probe	230727SP
Belt clip (3 pcs)	227710SP
Battery cover (3 pcs)	225688SP

** See the HM40 order form when ordering a spare probe for HM40.*

Dimensions

Dimensions in mm



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HMI41 Indicator and HMP42/HMP46 Probes

The Vaisala HUMICAP® Humidity Indicator HMI41 fitted with the Vaisala HUMICAP® Humidity and Temperature Probes HMP42 or HMP46 can be used for spot checking and field calibration applications.

In addition to displaying the humidity and temperature readings, the HMI41 indicator calculates dew point and wet bulb temperature, absolute humidity and mixing ratio.

The indicator has an easy-to-read two line liquid crystal display. The display units (metric or non-metric) are easily selected.

These features, plus fast response time, high measurement accuracy and excellent stability, as well as the unique properties of the probe chosen – either the HMP42 or the HMP46 – make the HMI41 indicator and HMP42/46 combination an ideal choice for the most demanding applications.

Features/Benefits

- RH measurement range 0 ... 100 %RH
- Temperature measurement range -40 ... +100 °C (-40 ... +212 °F), with the HMP46 only for short periods up to +180 °C (+356 °F)
- Calculates dew point, wet bulb temperature, absolute humidity and mixing ratio
- Versatile and easy-to-use
- Incorporates Vaisala HUMICAP® Sensor
- Excellent stability
- Data collection with serial line
- NIST traceable (certificate included)
- Optional carrying case and calibration cable

Vaisala HUMICAP® Humidity and Temperature Probe HMP42

The HMP42 probe can be used for spot checking humidity and temperature in applications which require an extremely thin probe. Typically the probe is used for monitoring the drying of structures during construction or after water damage. It is ideal to be used when measuring in any tight places, in ducts or chambers or, for example, under a linoleum floor.

The probe diameter is only 4 mm, allowing access into very small, tight, and hard-to-reach spaces.

Vaisala HUMICAP® Humidity and Temperature Probe HMP46

Typical applications for the HMP46 are plant maintenance, installation and inspection of air conditioning systems, production and storage areas and production processes. The HMP46 operates in full humidity range of 0 ... 100 %RH. The temperature range is from -40 to +100 °C (-40 ... +212 °F). For short periods of time, the probe can withstand temperatures up to +180 °C (+356 °F).

The HMP46 probe is solid and rugged. Its stainless steel probe is made to withstand rough handling in mechanically demanding applications. The probe's long shaft can also reach otherwise unreachable places.

High Performance Sensor

The HMP42/46 probes incorporate Vaisala HUMICAP® Sensor. This sensor has high accuracy, excellent long-term stability and negligible hysteresis. In addition, the sensor is insensitive to dust, particulate dirt and most chemicals.

The Vaisala HUMICAP® Humidity Indicator HMI41 equipped with the Vaisala HUMICAP® Humidity and Temperature Probe HMP42 – an extremely thin probe allowing access into very small, tight, hard-to-reach spaces.

The Vaisala HUMICAP® Humidity Indicator HMI41 equipped with the Vaisala HUMICAP® Humidity and Temperature Probe HMP46 – a rugged stainless steel probe for mechanically demanding and high temperature applications.

Technical Data

HMI41 Indicator

Calculated variables	dew point temperature, absolute humidity, wet bulb temperature, mixing ratio
Resolution	0.1 %RH; 0.1 °C/°F
Power supply	4 batteries, type AA (LR 6)
Battery operation time (alkaline batteries)	72 h continuous use
Auto-off function	
Operating temperature	-20 ... +60 °C (-4 ... +140 °F)
Storage temperature	-40 ... +70 °C (-40 ... +158 °F)
Display	two line LCD
Housing material	ABS plastic
Housing classification	IP53 (with connectors blocked)
Weight (incl. batteries)	300 g
Maximum measurement error of indicator at +20 °C	
humidity	±0.1 %RH
temperature	±0.1 °C (±0.18 °F)

HMP42 Probe

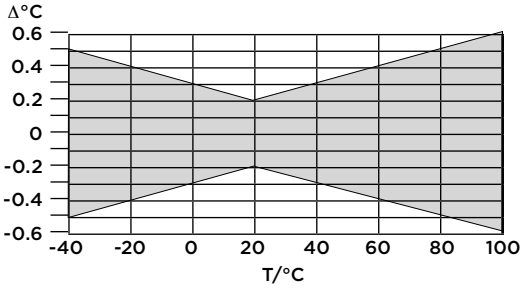
HUMIDITY

Measurement range	0 ... 100 %RH
Accuracy (incl. non-linearity, hysteresis and repeatability) at +20 °C (+68 °F)	
0 … 90 %RH	±2 %RH
90 … 100 %RH	±3 %RH
Factory calibration uncertainty (+20 °C / +68 °F)	
0 … 15 %RH	±1 %RH
15 … 78 %RH	±1.5 %RH
Temperature dependence of electronics	±0.05 %RH/°C
Typical long-term stability	better than 1 %RH per year
Response time (90%) at +20 °C in still air	30 s

TEMPERATURE

Measurement range HMP42	-40 ... +100 °C (-40 ... +212 °F)

Temperature accuracy over measurement range



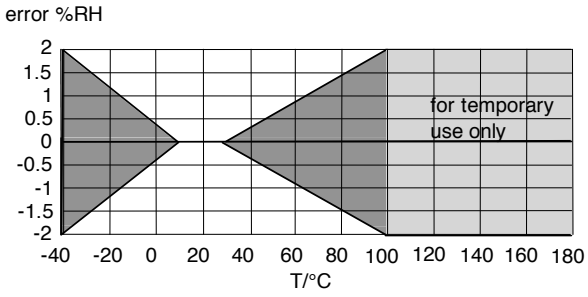
Temperature sensor	Pt100 RTD Class F0.3 IEC 60751

HMP46 Probe

HUMIDITY

Measurement range	0 ... 100 %RH, non-condensing
Accuracy (incl. non-linearity, hysteresis and repeatability) at +20 °C (+68 °F)	
0 … 90 %RH	±1 %RH
90 … 100 %RH	±2 %RH
Factory calibration uncertainty (+20 °C / +68 °F)	
0 … 15 % RH	±1 %RH
15 … 78 %RH	±1.5 %RH

Temperature Dependence

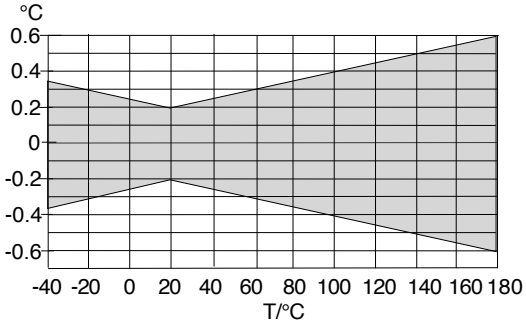


Typical long-term stability	better than 1 %RH per year
Response time (90%) at +20 °C in still air w/sintered filter	15 s

TEMPERATURE

Continuous measurement	-40 ... +100 °C (-40 ... +212 °F)
Short-term measurement	-40 ... +180 °C (-40 ... +356 °F)
Temperature accuracy at +20 °C (+68 °F)	±0.2 °C (±0.36 °F)

Temperature accuracy over the measurement range



Temperature sensor	Pt100 RTD Class F0.1 IEC 60751

Technical Data

General for Probes

Cable length	1500 mm; extended spiral cable
Operating temperature range	
for electronics	-20 ... +60 °C (-4 ... +140 °F)
Housing material	
electronics housing	ABS plastic
probe	stainless steel
Housing classification	
electronics	IP65 (NEMA 4)
HMP42 sensor protection	
steel grid	19867HM
membrane, tube set (5 pcs)	19858HM
HMP46 sensor protection	
sintered filter	0195
optional membrane filter, (max +80 °C / +176 °F)	10159HM
plastic grid, (max +80 °C / +176 °F)	6221
Weight	
HMP42	200 g
HMP46	450 g
Electromagnetic compatibility	Complies with EMC standard EN61326-1, Portable Equipment.

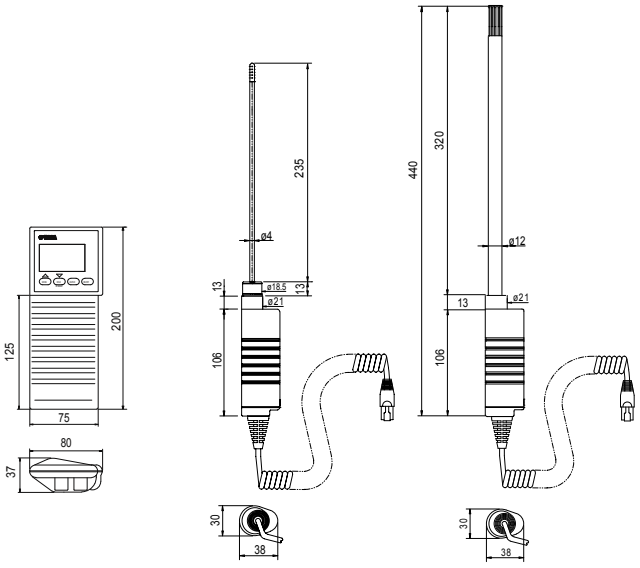
Accessories

Transmitter calibration cables	
HMT330, HMT120/130	25917ZZ
HMT360	25916ZZ
HMM210	19164ZZ
HMD/W60/70	19116ZZ
Carrying case for HMI41 & HMP42/46	
plastic	210614
aluminum	MI70CASE2
Serial communication cable	19446ZZ
HMP42	
Calibration adapter	HM37067
Rubber sleeve set	19809HM

Dimensions

Dimensions in mm.

HMI41 HMP42 HMP46



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Events

SHM40 Structural Humidity Measurement Kit

Vaisala HUMICAP® Structural Humidity Measurement Kit SHM40 offers an easy and reliable solution for humidity measurements in concrete and other structures.

Concrete dries unevenly and is usually drier on the surface, consequently it is important to measure beneath the surface conditions. The borehole method provides information about the humidity profile under the surface. In this method, a humidity probe is left in the borehole until the humidity in the hole has reached an equilibrium state and the stabilized values can be read.

SHM40 Is All You Need for Borehole Humidity Measurement

The Vaisala HUMICAP® Structural Humidity Measurement Kit SHM40 is an ideal solution for the borehole method. The starter kit is comprised of an HMP40S probe, HM40 indicator and accessories for the borehole method in a weather-proof case, optimized for use in harsh and humid construction sites.

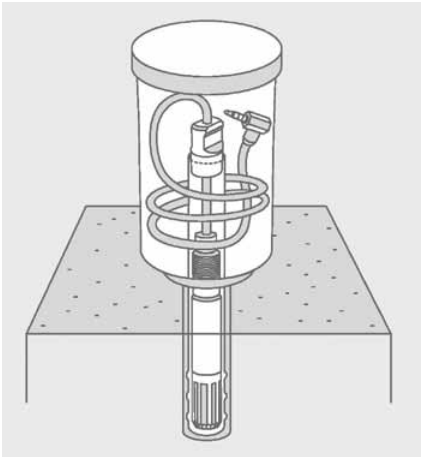
Additional accessories for the SHM40 can be used to prepare a moisture measurement hole in fresh concrete. Pre-formed holes eliminate the need for drilling and the risk of damaging heating elements or tubing embedded in the concrete.

Easy Measurement with Multiple HMP40S Probes and Quick Connectors

HMP40S measurement probes are interchangeable. The probes connect easily to the HM40 indicator with a snap-on connector enabling convenient use of multiple probes with one indicator. The measurement data can be displayed in numeric, statistic or graph views.

Features or Benefits

- Easy to use
- Truly interchangeable measurement probes
- Durable
- Accurate measurement data in numeric, statistic or graph views
- Conforms to ASTM standard F2170
- IP65 classified measurement probe and case



A borehole in concrete and a measurement probe HMP40S inserted in it.

Snapping a connector to the indicator HM40 to read the measurement results.

Standard Contents of SHM40

- HM40 indicator with adapter
- 1 piece HMP40S RH&T probe with a cable
- 12 pcs plastic tubes (19266HM)
- 12 pcs rubber plugs (233976)
- 3 pcs protective covers with lid (19268HM)
- NIST traceable certificate
- Weather-proof carrying case with a shoulder strap

Technical Data

HMP40S Probe

Relative Humidity

Measurement range	0 ... 100 %RH
Accuracy (incl. non-linearity, hysteresis, and repeatability):	
temperature range	0 °C ... +40 °C
0 ... 90 %RH	± 1.5 %RH
90 ... 100 %RH	± 2.5 %RH
temperature range	-40 °C...0 °C and +40 °C ... +80 °C
0 ... 90 %RH	± 3.0 %RH
90 ... 100 %RH	± 4.0 %RH
Factory calibration uncertainty at +20°C (68°F)	
0 ... 90 %RH	± 1.1 %RH
90 ... 100 %RH	± 1.8 %RH
Humidity sensor	HUMICAP® 180R
Stability	± 2 %RH over 2 years

Temperature

Measurement range	-40 °C ... +80 °C
Accuracy over temperature range:	
0 ... +40 °C	± 0.2 °C
-40 ... 0 °C, +40 ... +80 °C	± 0.4 °C
Temperature Sensor	Pt1000 RTD Class F0.1 IEC 60751

General

Operating temperature range for probe	-40 °C ... +80 °C
Probe weight with standard cable	31 g
Probe housing material	stainless steel
Probe filter and sensor protection	membrane filter with chrome coated ABS plastic
Cable material	Wire PVC / jacket PU
Cable connector	TRRS male 3.5 mm
Probe housing classification	IP65
Borehole diameter needed	16 mm
Measurement depth with standard accessories	min. 30 mm, max. 90 mm

HM40 Indicator

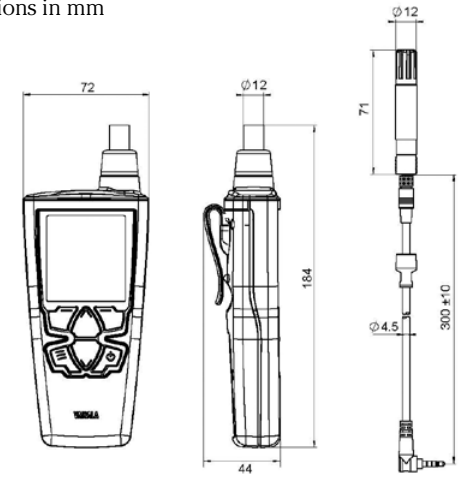
Operation temperature range for indicator	-10 ... +60 °C
Storage temperature range	-30 ... +70 °C
Weight	
Indicator with adapter	240 g
SHM40 case with standard content	3.7 kg
Indicator materials	PC/ABS blend, acrylic display lens
Indicator adapter materials	Nickel plated brass and plastic overmolding
Indicator housing classification	IP54
Mechanical drop endurance	1.0 m without the probe
Power-up time	< 3 s
Alkaline batteries	2 x AA sized, 1.5V (LR6)
Operation time (Alkaline batteries)	typical 100 hours (without backlight)
Calculated variables	Td, Tw, a, x, h
Menu languages	English, German, French, Finnish, Spanish, Swedish, Chinese (simplified), Russian, Japanese
Display	LCD (140 x 160 pixels)
Electromagnetic compatibility (EMC)	European Union directive EN61326-1 for portable equipment

Accessories and Spare Parts

HM40 indicator with adapter and cable probe	HM40S
RH&T probe with cable	HMP40S
HM40 indicator with adapter	HM40SINDI
Quick connection adapter	HM40SADAPTER
Cable for RH&T probe	HMP40SCABLE
Long cable (2.7 m) for RH&T probe	HMP40SCABLE2
Plastic tube set (12 pcs)	19266HM
Rubber plugs (12 pcs)	233976
Protective cover with lid (3 pcs)	19268HM
Weather-proof carrying case with SHM40 filling	233815
USB recharger for HM40 indicator batteries	229249SP
Plastic grid with membrane filter for HMP40S probe	DRW010525SP
ACCESSORIES FOR WET CONCRETE	
Plastic flange set (12 pcs)	26529HM
Long rubber plug for wet concrete (12 pcs)	26530HM

Dimensions

Dimensions in mm



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HMK15 Humidity Calibrator

three step plugs to fit all chamber holes (12 mm, 13.5 mm and 18.5 mm)
transit covers for secure transportation and long-term storage
thermometer with calibration certificate

In addition to laboratory use, Vaisala Humidity Calibrator HMK15 is suitable for on-site checks of humidity probes and transmitters.

Features/Benefits

- Easy and reliable calibration of humidity probes and transmitters
- Based on saturated salt solutions
- Fast temperature equilibration
- No external power required
- Suitable for laboratory use and on-site checks
- Chambers and transit covers make HMK15 easy to transport
- Pre-measured certified salts available
- Vaisala Service Centers offer accredited calibrations for humidity, temperature and barometric pressure.

No measuring instrument stays accurate by itself. It is essential that the functioning of an instrument is periodically checked against a reference. Vaisala has developed the Vaisala Humidity Calibrator HMK15 to make calibration and spot checking of humidity probes and transmitters easy and reliable.

Method Used by Leading Laboratories

The operating principle of the HMK15 is based on the fact that a saturated salt solution generates a certain relative humidity in the air above it. The reading of the humidity probe or transmitter can then be adjusted accordingly. Many leading laboratories use this generally accepted and reliable method to calibrate humidity instruments. Usually two or three different salt solutions are used. Salts are chosen according to the application.

Certified Salts

The HMK15 can be ordered with certified and pre-measured salts. A sample calibration is made from each batch in Vaisala's Measurement Standards Laboratory (MSL).

Calibrated Thermometer

The HMK15 can be ordered with a thermometer, which is used for measuring the temperature during the calibration. It can also be used for checking the temperature measurement accuracy of the transmitter. The thermometer can contain either mercury (accuracy ±0.3 °C (±0.54 °F)) or red capillary fluid (accuracy ±1.0 °C (±1.8 °F)).

FINAS Accredited Measurement Standards Laboratory

Vaisala's Measurement Standards Laboratory is a FINAS accredited calibration laboratory. FINAS is a member of the EA (the European Cooperation for Accreditation).

FINAS
Finnish Accreditation Service
K008 (EN ISO/IEC 17025)

Technical Data

General

The standard HMK15 consists of the following parts:

- Two salt chambers, chamber covers and transit covers
- Base plate
- Choice of thermometers
  - mercury thermometer, Vaisala calibrated, order code 19728HM
  - thermometer with red capillary liquid, calibrated by manufacturer, order code 25130HM
- Measurement cup and mixing spoon

Options

Certified and ready dosed salts:		Order code:	Total uncertainty*:
LiCl salt	11 %RH	19729HM	(±1.3 %RH)
$MgCl_2$ salt	33 %RH	19730HM	(±1.2 %RH)
NaCl salt	75 %RH	19731HM	(±1.5 %RH)
K_2SO_4 salt	97 %RH	19732HM	(±2.0 %RH)

*Uncertainties given at +20 °C

Ion exchanged water	19767HM
Extra salt chambers	19766HM
Carrying bag	HM27032

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HMP155 Humidity and Temperature Probe

HMP155 with an additional temperature probe and optional Stevenson screen installation kit.

Features/Benefits

- Vaisala HUMICAP®180R sensor - superior long-term stability
- Optional warmed humidity probe and chemical purge
- Plug-and-play
- USB connection for service use
- Fits with DTR13 and DTR503 radiation shields and also for a Stevenson screen
- Weather-proof housing IP66
- Optional, fast temperature probe
- Different output possibilities: voltage, RS-485, resistive Pt100
- Applications: meteorology, aviation and road weather, instrumentation

The Vaisala HUMICAP® Humidity and Temperature Probe HMP155 provides reliable humidity and temperature measurement. It is designed especially for demanding outdoor applications.

Long-term Stability

The HMP155 has the proven Vaisala HUMICAP®180R sensor that has excellent stability and withstands well harsh environments. The probe structure is solid and the sensor is protected by default with a sintered teflon filter, which gives maximum protection against liquid water, dust, and dirt.

Warmed Probe and High Humidity Environment

Measuring humidity reliably is challenging in environments where humidity is near saturation. Measurements may be corrupted by fog, mist, rain, and heavy dew. A wet probe may not give an accurate measurement in the ambient air. This is an environment to which Vaisala has designed a patented, warmed probe for reliable measuring. As the sensor head is warmed continuously, the humidity level inside it stays below the ambient level. Thus, it also reduces the risk of condensation forming on the probe.

Fast Measurements

With its fast response time, the additional temperature probe for the HMP155 is ideal for measurement in environments with changing temperatures. The new membrane filter speeds up the RH measurement.

Long Lifetime

Protecting the sensor from scattered and direct solar radiation, and precipitation will increase its lifetime. Thus, Vaisala recommends installing the HMP155 in one of the following radiation shields: DTR503, DTR13, or a Stevenson screen. For the additional temperature probe, an installation kit is available to be used with DTR502 radiation shield.

Easy Maintenance

The probe can be calibrated using a pc with a USB cable, with the push buttons, or with the MI70 indicator.

Technical Data

Performance

RELATIVE HUMIDITY

Measurement range	0 ... 100 %RH
Accuracy (incl. non-linearity, hysteresis and repeatability) at	
+15 ... +25 °C (+59 ... +77 °F)	±1 %RH (0 ... 90 %RH) ±1.7 %RH (90 ... 100 %RH)
-20 ... +40 °C (-4 ... 104 °F)	±(1.0 + 0.008 x reading) %RH
-40 ... -20 °C (-40 ... -4 °F)	±(1.2 + 0.012 x reading) %RH
+40 ... +60 °C (+104 ... +140 °F)	±(1.2 + 0.012 x reading) %RH
-60 ... -40 °C (-76 ... -40 °F)	±(1.4 + 0.032 x reading) %RH
Factory calibration uncertainty (+20 °C /+68 °F)	±0.6 %RH (0 ... 40 %RH)* ±1.0 %RH (40 ... 97 %RH)*

* Defined as ±2 standard deviation limits. Small variations possible, see also calibration certificate.

Recommended humidity sensor	HUMICAP®180R(C)
Response time at +20 °C in still air with a sintered PTFE filter	
63 %	20 s
90 %	60 s

TEMPERATURE

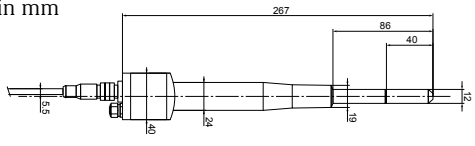
Measurement range	-80 ... +60 °C (-112 ... +140 °F)
Accuracy with voltage output at	
-80 ... +20 °C	±(0.226 - 0.0028 x temperature) °C
+20 ... +60 °C	±(0.055 + 0.0057 x temperature) °C
passive (resistive) output	
according to IEC 751 1/3 Class B	±(0.1 + 0.00167 x |temperature|)°C
RS485 output	
-80 ... +20 °C	±(0.176 - 0.0028 x temperature) °C
+20 ... +60 °C	±(0.07 + 0.0025 x temperature) °C
Accuracy over temperature range (opposite)	
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751
Response time with additional temperature probe in 3 m/s air flow	
63 %	<20 s
90 %	<35 s

OTHER VARIABLES

dew point/frost point temperature, wet bulb temperature, mixing ratio

Dimensions

Dimensions in mm



General

Operating temperature range	-80 ... +60 °C (-112 ... +140 °F)
Storage temperature range	-80 ... +60 °C (-112 ... +140 °F)
Connection	8-pin male M12 connector
Connection cables	3.5, 10, and 30 m
Cable material	PUR
Wire size	AWG26
Service cables	USB connection cable MI70 connection cable
Additional T probe cable length	2 m
Housing material	PC
Housing classification	IP66
Sensor protection	sintered PTFE optional membrane filter
Weight (probe)	86 g

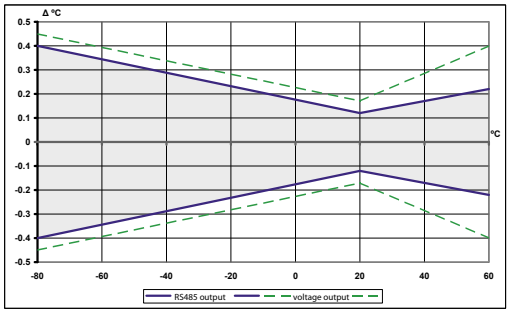
Electromagnetic compatibility: Complies with the EMC standard EN61326-1, Electrical equipment for measurement control and laboratory use - EMC requirement for use in industrial locations

Inputs and Outputs

Operating voltage	7 ... 28 VDC*

*Note: minimum operating voltage 12 V with 0 ... 5 V output and 16 V with 0 ... 10 V output, probe heating, chemical purge or XHEAT.

Outputs	
voltage output	0 ... 1 V, 0 ... 5 V, 0 ... 10 V
resistive Pt100 (4-wire connection)	
RS485	
Average current consumption (+15 VDC, load 100 kOhm)	
0 ... 1 V output	<3 mA
0 ... 10 V output	+0.5 mA
RS485	<4 mA
during chemical purge	max. 110 mA
with warmed probe	max. 150 mA
Settling time at power-up	
voltage output	2 s
RS485	3 s



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DTR500 Solar Radiation and Precipitation Shields

The Vaisala Solar Radiation Shield Series DTR500 are available in either a 5-, 9- or 12-plate models.

Features/Benefits

- Protects temperature and humidity probes from scattered, as well as, direct solar radiation and rain.
- Maintenance-free
- Naturally ventilated
- Installs easily on a vertical pole, horizontal beam or flat surface
- Suitable for a wide range of applications
- Choice of shields and mounting accessories

The Vaisala Radiation Shield Series DTR500 are solar radiation and precipitation shields supporting humidity probe installations in outdoor applications.

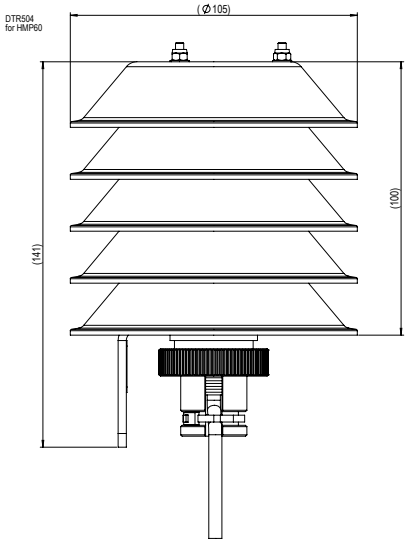
Shield Protects Sensor

The maintenance-free DTR500 series shields protect the humidity and temperature sensors from solar radiation and precipitation. They provide excellent ventilation while blocking both direct and reflected solar radiation.

The special plastic used in the plates has excellent thermal characteristics; the white outer surface reflects radiation; the black inside absorbs accumulated heat. The shields can be easily installed on either a vertical pole, horizontal beam, or a flat surface.

The DTR Shields can be used with the following Vaisala products:

- **DTR502(A)** with adapter 221072 for Vaisala HUMICAP® Humidity and Temperature Probe HMP155's additional temperature sensor
- **DTR502B** for Vaisala HUMICAP® Humidity and Temperature Transmitters HMT333, HMT337, HMT363 and HMT367 and Vaisala Combined Pressure, Humidity and Temperature Transmitters PTU303 and PTU307
- **DTR503(A)** for Vaisala HUMICAP® Humidity and Temperature Probe HMP155



DTR504 for HMP60, HMP110 and HMT120/130 remote probes. Refer to drawings of DTR502B for dimensions of DTR504A pole mast installation accessory.

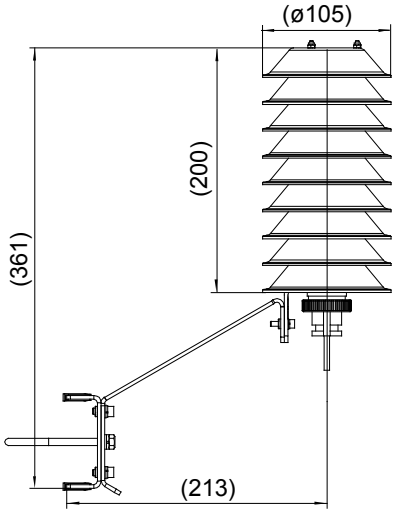
- **DTR503B** for Vaisala HUMICAP® Humidity and Temperature Transmitters HMD60/70
- **DTR504(A)** for Vaisala HUMICAP® Humidity and Temperature Transmitters HMT120/130, Vaisala HUMICAP® Humidity and Temperature Probe HMP110 and Vaisala INTERCAP® Humidity and Temperature Probe HMP60

Technical Data

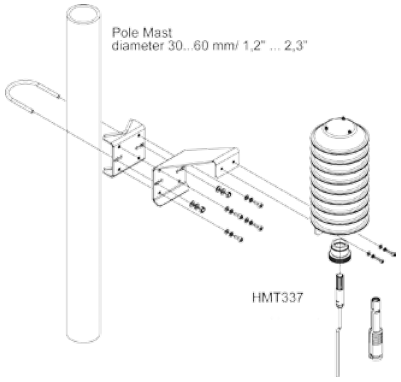
Dimensions

Dimensions in mm.

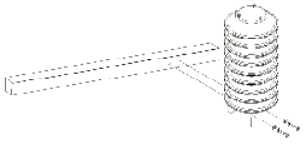
DTR502B
for HMT333, HMT337, HMT363, HMT367, PTU303 and PTU307



DTR502B pole mast installation.



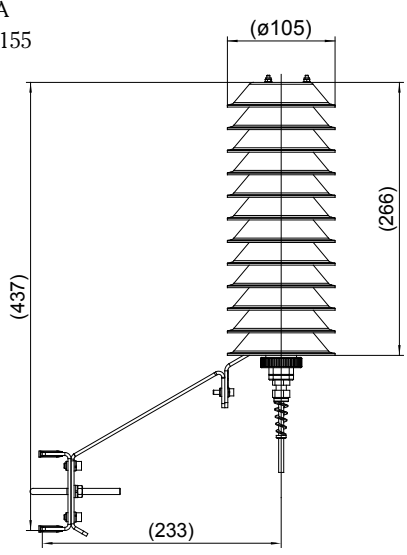
DTR502 horizontal beam installation.



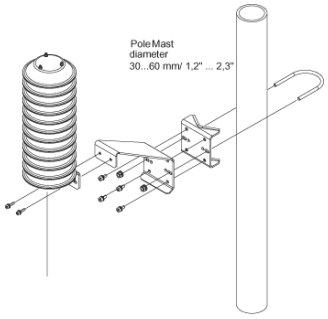
Dimensions

Dimensions in mm.

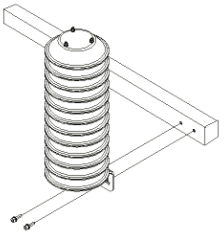
DTR503A
for HMP155



DTR503A pole mast installation.



DTR503 horizontal beam installation.



- DTR502/503/504 include only horizontal beam assembly
- DTR502A/503A/504A include also pole mast installation kit
- DTR502B/503B include also product specific adapter

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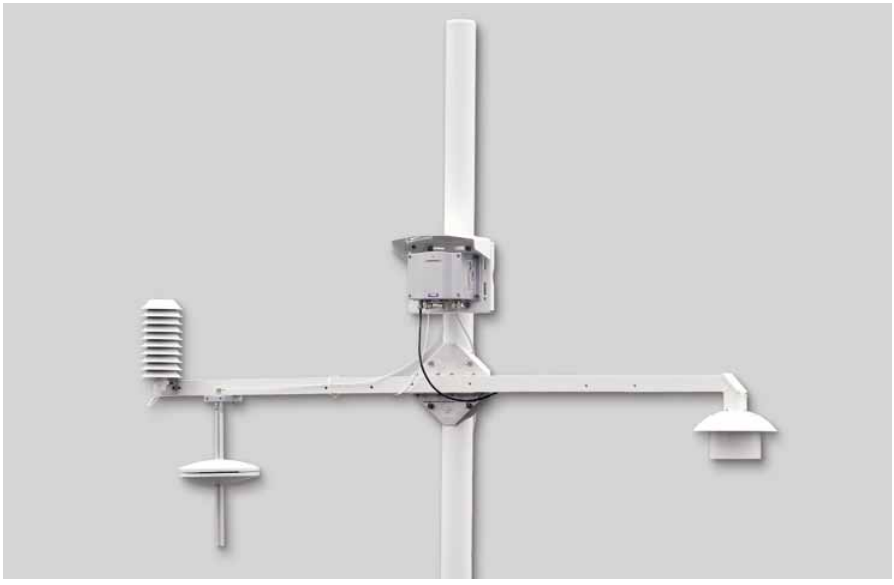
HMT330MIK Meteorological Installation Kit



The HMT337 and PTU307 feature warmed probe technology. Installed with the HMT330MIK kit either one forms the right choice for reliable humidity measurement in humid weather conditions.

Features/Benefits

- For outdoor humidity and temperature measurements
- Can be ordered in a variety of configurations
- Used together with HMT337 transmitter or PTU307
- Vaisala SPH 10/20 Static Pressure Head eliminates effectively pressure variations in the barometer caused by wind

HMT337/PTU307 Features

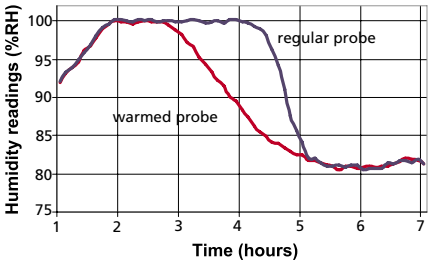
- Warmed probe provides true humidity readings in condensing conditions
- Humidity measurement expressed as relative humidity and/or dew point temperature
- Easy field calibration with the HM70 hand-held meter

The Vaisala Meteorological Installation Kit HMT330MIK enables the Vaisala HUMICAP® Humidity and Temperature Transmitter HMT337 to be installed outdoors to obtain reliable measurements for meteorological purposes.

True Humidity Readings in Condensing Conditions

In weather observations dew formation makes reliable humidity measurement difficult. When dew has formed on the humidity sensor, it is impossible to obtain a true reading until this dew evaporates.

Both the PTU307 and HMT337 avoid this problem by warming the probe. When warmed, the relative humidity inside the probe stays below the ambient level. With an accurate temperature measurement, the ambient dew point can be calculated precisely. To obtain the ambient relative humidity, an additional probe measures the ambient temperature,



After a period of 100 % relative humidity, the warmed probe measures the true humidity, whereas the non-warmed probe takes time to recover from the condensation.

and the transmitter calculates the relative humidity from the dew point and temperature values.

Open Shield Prevents Microclimates

The warmed probe of the HMT337/PTU307 is mounted in a shield which is open at the bottom to ensure steady air circulation to the sensor even in calm weather.

In traditional radiation shields sleet or snow can accumulate on the shield and prevent the proper air circulation through the shield, and create a humid microclimate until the snow melts.

Essential for Critical Weather Measurements

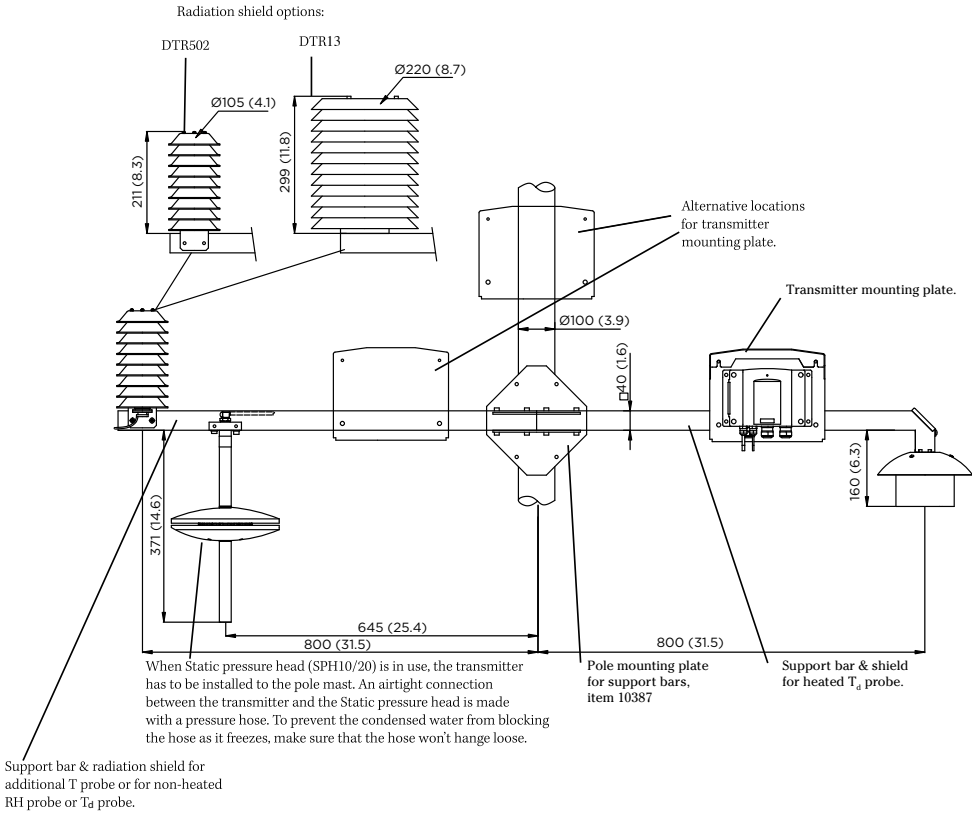
Obtaining a true humidity reading is particularly important e.g. in traffic safety: at airports and at sea as well as on the roads. It is essential, for example, in fog and frost prediction.

For calibration, a portable HMP77 reference probe is easy to attach beside the HMT337 or PTU307 probe.

Technical Data

Dimensions

Dimensions in mm (inches)


Radiation shield options:
DTR502
DTR13
Ø220 (8.7)
Ø105 (4.1)
211 (8.3)
299 (11.8)
Alternative locations for transmitter mounting plate.
Transmitter mounting plate.
Ø100 (3.9)
40 (1.6)
160 (6.3)
371 (14.6)
645 (25.4)
800 (31.5)
800 (31.5)
When Static pressure head (SPH10/20) is in use, the transmitter has to be installed to the pole mast. An airtight connection between the transmitter and the Static pressure head is made with a pressure hose. To prevent the condensed water from blocking the hose as it freezes, make sure that the hose won't hange loose.
Pole mounting plate for support bars, item 10387
Support bar & shield for heated T_d probe.
Support bar & radiation shield for additional T probe or for non-heated RH probe or T_d probe.

Order form

				1	2	3	4	5	
	Vaisala Meteorological Installation Kit		**HMT330MIK**						PRICE
1	Support bar & shield for warmed Td probe	**No support bar & shield for warmed Td probe**		**0**					
		Support bar & shield for warmed Td probe		*1*					
2	Support bar and radiation shield for additional T probe or for non-warmed RH or Td probe	**No support bar or radiation shield**			**A**				
		Support bar with DTR502 shield for T probe			*B*				
		Support bar with DTR13 shield for T probe			*C*				
		Support bar with DTR502 shield for non-warmed RH or Td probe			*D*				
		Support bar with DTR13 shield for non-warmed RH or Td probe			*E*				
3	Support bar mounting plate	**No mounting plate**				**0**			
		Pole mounting plate for support bar/bars (item 10387)				*1*			
4	Additional transmitter mounting plate (incl. rain shield)	**No additional transmitter mounting plate**					**A**		
		Transmitter mounting plate for support bar assembly					*B*		
		Transmitter mounting plate for pole assembly					*C*		
5	Static Pressure Head	**No Static Pressure Head**						**0**	
		Static Pressure Head SPH10	*Only for the PTU300*					*1*	
								TOTAL	
								QTY	
								TOTAL VALUE	

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HMT300TMK Turbine Mounting Kit for Power Turbine Intake Air Measurement

The Vaisala HUMICAP® Turbine Mounting Kit HMT300TMK is shown with the cover open and HMT337 Humidity and Temperature Transmitter installed. (Not included in the HMT300TMK.)

The Vaisala HUMICAP® Turbine Mounting Kit HMT300TMK is developed to monitor the air intake of gas and liquid fueled power turbines. HMT300TMK is used together with HMT337 Temperature and Humidity Transmitter.

Features/Benefits

- Designed for high humidity applications
- Measurement range: -40 ... +100°C
- Patented, warmed probe
- Incorporates Vaisala HUMICAP® Sensor for excellent accuracy and long-term stability and resistance to dust and most chemicals
- Low maintenance need
- Outer cover provides protection from rain and direct sunlight
- NIST traceable (certificate included)

It is ideal for measuring in water vapor injection applications because the sensor has been optimized for high humidity environments by utilizing a patented, warmed probe. Water vapor is added to the intake of the turbine to increase the mass flow which in turn increases compression and electrical power output.

Low Maintenance

Power turbines also require exact water vapor injection in the chamber to reduce pollutant emissions. Vaisala's warmed probe technology is ideal because of its reliability in the field. In fact, the only suggested scheduled maintenance is annual calibration.

Patented, Warmed Probe Prevents Condensation

The HMT300TMK with the HMT337 installed, provides fast and reliable dewpoint measurement especially under high humidity conditions where dew would normally form on the humidity sensor and thereby cause errors in measurement. The patented warmed probe prevents condensation from forming on the sensor.

Protective Enclosure

The HMT300TMK includes a white, painted stainless steel enclosure with an installation kit for the probe. The HMT337 Humidity and Temperature Transmitter is installed in the stainless steel enclosure at the factory, when ordered together with HMT300TMK. The instrument can be equipped to be powered with either 24 VDC/VAC or with an internal 110/230 volt power supply unit.

The outer cover protects the transmitter from direct sun light and rain. The installation kit protects the probe from outer water splashes, keeps the sensor dry, and prevents any parts that could vibrate loose from entering the turbine.

The HMT300TMK can be ordered separately for installation with the customer's existing HMT337.

HUMICAP® Performance

The HMT330 Series Transmitters are fitted with the latest generation of the HUMICAP®, the polymer sensor known for its accuracy, reliability and long-term stability. The sensor has a high tolerance for particulate abrasion and chemical contamination.

Vaisala HUMICAP® Humidity and Temperature Transmitter HMT337

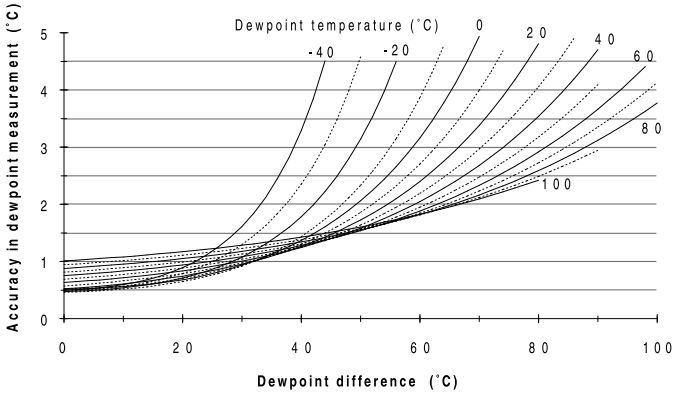
The HMT337 is intended for demanding industrial humidity measurement applications with a risk of condensation. The stainless steel probe is mechanically durable and preferred for most industrial applications.

Technical Data

Dewpoint Temperature

Measurement range	-40 ... +100 °C (-40 … +212 °F)

Accuracy: find the intersection of the dewpoint temperature curve and the dewpoint difference reading (process temperature - dewpoint temperature) on the x-axis and read the accuracy in dewpoint measurement at the y-axis



Response time (90 %) at +20 °C (68 °F) in still air (PPS grid with steel netting)	20 s
Sensor	HUMICAP® 180C

General

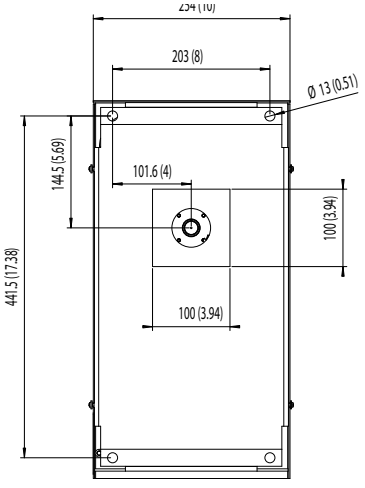
Connections	screw terminals for 0.5 mm² wires (AWG 20), stranded wires recommended
Operating voltage	24 VDC/VAC (20...28 V) or 115/230 VAC (Must be specified at time of order)
Recommended external load for current outputs	< 500 ohm
0...1 V output	> 2 kohm (to ground)
0...5 & 0...10 V outputs	> 10 kohm (to ground)
Operating temperature range for electronics	-40...+60 °C (-40 ... +140 °F)
Storage temperature	-55...+80 °C (-67 ... +176 °F)
Housing material	G-AlSi10 (DIN 1725)
Housing classification	IP65 (NEMA 4)
Bushing	8...11 mm diameter cables (0.31 ... 0.43 inch)
Humidity sensor protection (Ø 12 mm)	PPS grid with steel netting
Weight:	
HMT300TMK with HMT337	8,7 kg
HMT300TMK with HMT337, packed in a wooden shipping box	13,3 kg
Electromagnetic compatibility	Complies with EMC standard EN61326-1, Industrial Environment

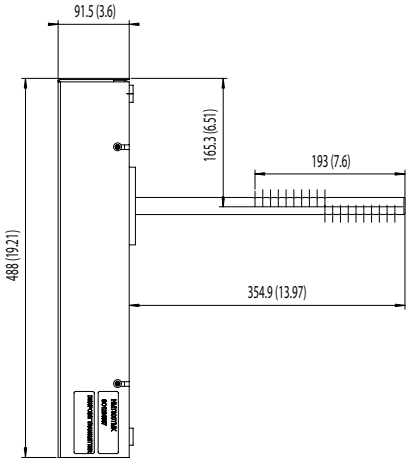
Outputs

Two standard outputs, third optional	0...20 mA, 4...20 mA, 0 ... 1 V, 0...5 V, 0 ... 10 V
Typical accuracy of analog output at +20 °C (+68 °F)	±0.05 % full scale
Typical temperature dependence of analog output	±0.005 %/°C full scale
Serial output available	RS232C (optional RS485)

Dimensions

Dimensions in mm (inches)





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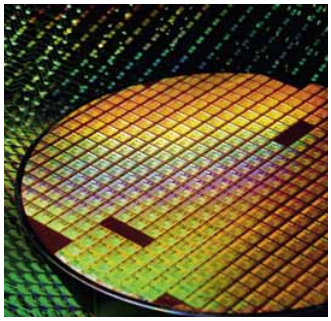
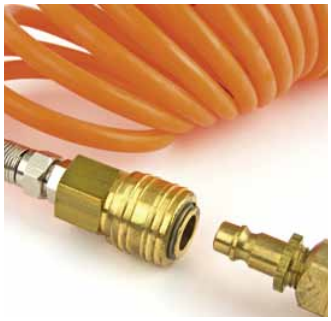
VAISALA / TECHNOLOGY DESCRIPTION

Vaisala DRYCAP® Sensor for Measuring Dew Point

In 1997 Vaisala introduced DRYCAP®, a new type of dew point sensor based on thin-film polymer technology. Since its launch, the DRYCAP product family has grown to encompass a huge range of applications, from drying processes to compressed air and dry chambers. The DRYCAP sensor is particularly renowned for its reliable performance in hot and very dry environments.

How It Works

DRYCAP's unrivalled performance is based on two innovations: the proven capacitive thin-film polymer sensor and the auto-calibration function.

The sensor's thin-film polymer absorbs or releases water vapor as the surrounding humidity increases or decreases. The dielectric properties of the polymer change as the humidity around the sensor changes, as does the capacitance of the sensor. Capacitance is converted into a humidity reading. The capacitive polymer sensor is bonded together with a temperature sensor, and dew point is calculated from the humidity and temperature readings.

Vaisala's patented auto-calibration function optimizes the measurement stability at low dew points. The sensor is heated at regular intervals during the automated auto-calibration procedure. The humidity and temperature readings are monitored as the sensor cools to ambient temperature, with offset correction compensating for any potential drift. This enables the DRYCAP sensor to deliver accurate measurements in the long term, dramatically reducing the need for maintenance.

Typical Applications for Dew Point Measurement

Vaisala DRYCAP dew point instruments measure dew point in industrial applications, where gas humidity is typically very low. Dew point is often a critical parameter, with inadequate control resulting in problems such as process downtime, damaged process equipment, and deterioration in end-product quality.

Dew point is measured in various drying and heat-treatment processes. It is also controlled in compressed air, where excess moisture can result in poor end-product quality, ice formation, and equipment corrosion.

DRYCAP in Brief

- Thin-film polymer sensor with unique auto-calibration function
- Wide measurement range, dew point measurement down to -80 °C (-112 °F)
- Accuracy ± 2 °C (± 3.6 °F)
- NIST-traceable dew point measurement

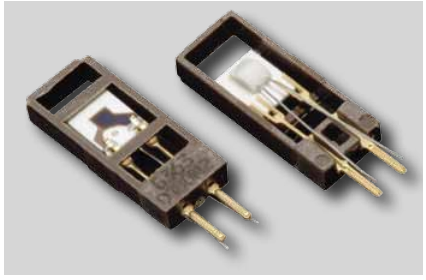
DRYCAP's Unique Benefits

- Excellent long-term stability, with recommended 2-year calibration interval
- Rapid response time
- Withstands condensation and recovers rapidly
- Resistant to particulate contamination, oil vapor, and most chemicals

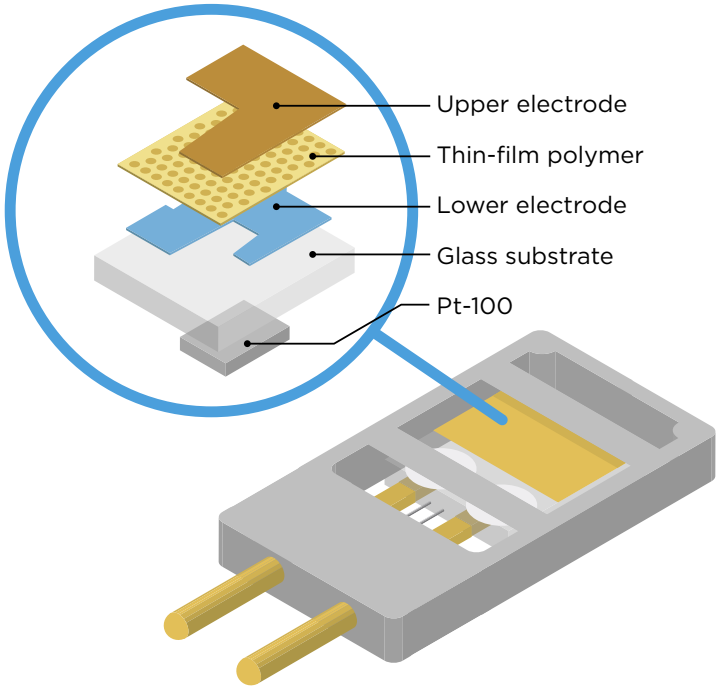
Other typical applications include medical gas, dry environments in lithium battery manufacturing, and gas-insulated high-voltage equipment used in the power industry.

Vaisala DRYCAP Dew Point Products

Vaisala's dew point instruments are suitable for accurate and stable monitoring of dry conditions in a variety of applications from -80 to +100 °C Td. Vaisala's product range includes transmitters for demanding industrial applications, compact instruments for installation in dryers, and hand-held meters for spot checking. Portable sampling systems are also available. View the complete range of dew point products at www.vaisala.com/dewpoint.



DRYCAP sensor.



Structure of the DRYCAP sensor.

The DRYCAP Story

The DRYCAP story began in the mid-1990s following an unresolved measurement challenge. Traditional humidity instruments were not accurate enough at very low humidities, while commonly used aluminum oxide sensors were prone to drift and required frequent calibration. There was strong demand for accurate, easy-to-use, cost-effective, and low-maintenance dew point instruments.

Vaisala's solution was to combine the highest quality polymer technology with a patented key feature – auto-calibration – that would eliminate sensor drift in very dry conditions. The result was the stable, reliable, and accurate DRYCAP sensor.

The first DRYCAP products were launched in 1997, and this highly successful innovation is still going strong today.

DRYCAP also led the way for the next great innovation: the world's first transmitter that monitors both dew point and process pressure simultaneously, aimed at compressed air customers worldwide. The story continues.

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For more information, visit www.vaisala.com or contact us at sales@vaisala.com

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DMT340 Series Dewpoint and Temperature Transmitters for Very Dry Conditions

The display shows measurement trends, real-time data, and measurement history.

Features/Benefits

- Measures dew point from -60 °C to +80 °C (-76 ... +176 °F) with an accuracy of ±2 °C (±3.6 °F)
- Vaisala DRYCAP® sensor provides accurate, reliable measurement with excellent long-term stability and a fast response time
- Condensation-resistant
- Unique auto-calibration feature
- Compatible with Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70
- NIST traceable calibration (certificate included)
- Graphical display and keypad for convenient operation
- Optional alarm relays and mains power supply module
- Analog outputs, RS232/485, WLAN/LAN
- MODBUS protocol support (RTU/TCP)

The Vaisala DRYCAP® Dewpoint and Temperature Transmitter Series DMT340 is designed for industrial low-humidity applications such as compressed air drying and metal treatment. The transmitters are very reliable, easy to use, and economical to maintain.

Stability at Low Dew Points

The Vaisala DRYCAP® sensor is immune to particulate contamination, water condensation, oil vapor, and most chemicals. Since the sensor is condensation-resistant, its performance is unmatched in low dew point applications where water spikes occur in the process. The sensor recovers rapidly from contact with free water.

Unique Auto-Calibration Feature

The stability of the DMT340 series is due to its unique auto-calibration function, developed by Vaisala. This feature allows the transmitter to perform calibration and adjustment by itself while the measured process is running. If the measurement accuracy is not confirmed, corrections are made automatically. The procedure is so quick and corrections so minor that it causes no disruption, ensuring easy maintenance and high performance. To maintain high performance, transmitters can be sent to Vaisala for calibration. Calibration intervals depend on the application; in normal conditions it is recommended to have calibration performed every two years.

Graphical Display of Measurement Data and Trends for Convenient Operation

The DMT340 features a large numerical and graphical display with a multilingual menu and keypad. It allows users to easily monitor operational data, measurement trends, and access measurement history for the past 12 months.

The optional data logger, with real-time clock, makes it possible to generate over four years of measurement history and zoom in on any desired time or time frame.

The display alarm allows tracking of any measured parameter, with freely configurable low and high limits.

Versatile Outputs and Data Collection

The DMT340 can support up to three analog outputs; an isolated galvanic power supply and relay outputs are also available.

For serial interface the USB connection, RS232, and RS485 can be used.

DMT340 is also capable of applying the MODBUS communication protocol and, together with an appropriate connection option, provides either MODBUS RTU (RS485) or MODBUS TCP/IP (Ethernet) communication.

The data logger, with real-time clock and battery backup, guarantees reliable logging of measurement data for over four years. The recorded data can be viewed on the local display or transferred to a PC with Microsoft Windows® software. The transmitter can also be connected to a network with an optional (W)LAN interface, which enables a (wireless) Ethernet connection. A USB service cable makes it easy to connect the DMT340 to a PC via the service port.

Easy Installation

DMT340 transmitters are delivered installation-ready, with a variety of installation options to choose from.

The Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70 is ideal for field-checking DMT340 transmitters.

The DMT342 probe is installed using a flange or sampling cell. The small probe is ideal for integration into larger equipment.

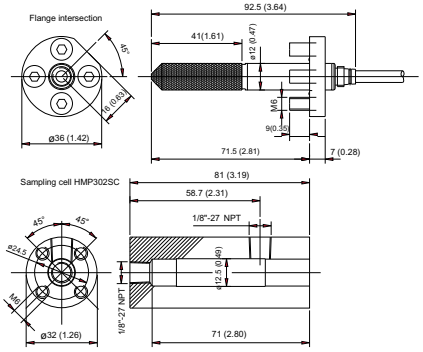
Probe Specifications

DMT342 with Small Size Flanged Probe

Pressure range	0 ... 50 bar/0 ... 725 psia
Mechanical durability	up to 250 bar/ 3625 psia
Probe diameter	12 mm/0.5"
Installation	
Flange	36 mm/1.4"
Sampling cell	HMP302SC

Dimensions

Dimensions in mm (inches)



The DMT344 features a threaded connection for extended pressures with different fitting-body options. It is ideal for permanent installation into pressurized or vacuum processes.

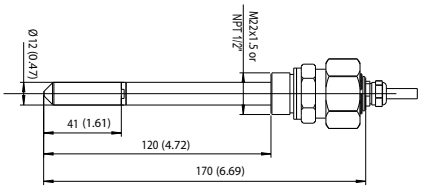
Probe Specifications

DMT344 with Probe for High Pressures

Pressure range	0 ... 50 bar/0 ... 725 psia
Mechanical durability	up to 100 bar/ 1450 psia
Probe diameter	12 mm/0.5"
Installation	
Fitting body	M22 x 1.5
Fitting body	NPT 1/2"

Dimensions

Dimensions in mm (inches)



The DMT347 probe is ideal for tight spaces with a thread connection. The small probe is installed using Swagelok® connectors.

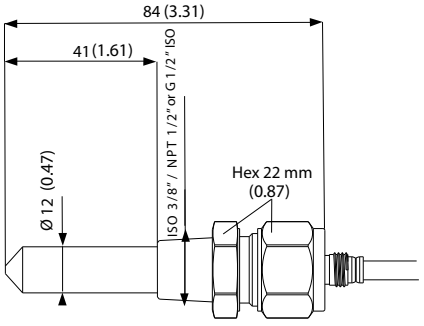
Probe Specifications

DMT347 with Small-Sized Probe

Pressure range	0 ... 10 bar/0 ... 145 psia
Mechanical durability	up to 10 bar/ 145 psia
Probe diameter	12 mm/0.5"
Installation	
Fitting body	R 3/8" ISO
Fitting body	G 1/2" ISO
Fitting body	NPT 1/2"

Dimensions

Dimensions in mm (inches)



The DMT348 is ideal for installation into pressurized processes where the probe needs to be able to be removed while the process is running. The probe depth is adjustable.

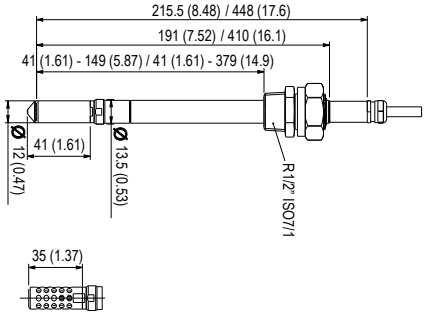
Probe Specifications

DMT348 with Probe for Pipeline Installations

Pressure range	0 ... 40 bar/0 ... 580 psia
Adjustable length	41 ... 149/371 mm/ 1.61 ... 5.87/14.6"
Installation	
Fitting body	R1/2" ISO
Fitting body	NPT 1/2"
Ball-valve set	BALLVALVE-1
Sampling cell	DMT242SC or DMT242SC2

Dimensions

Dimensions in mm (inches)



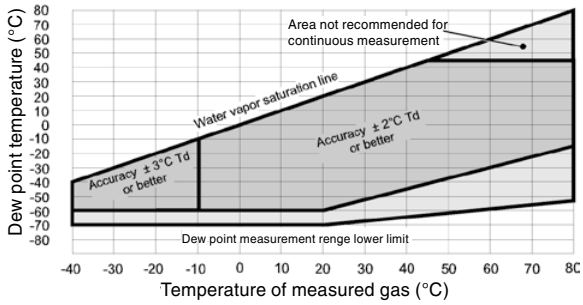
Optional filter for low pressures (suitable for all models)

Technical Data

Measured Parameters

DEW POINT

Sensor	Vaisala DRYCAP®180M
Measurement range	-60 ... +80 °C (-76 ... +176 °F) Td
For continuous use	-60 ... +45 °C (-76 ... +113 °F) Td
Accuracy	
up to 20 bar/290 psia	±2 °C/±3.6 °F
	(see the accuracy graph below)
20 ... 50 bar/290 ... 725 psia	additional inaccuracy +1 °C Td


Area not recommended for continuous measurement
Water vapor saturation line
Accuracy ±2°C Td or better
Accuracy ±3°C Td or better
Dew point measurement renge lower limit
Dew point temperature (°C)
Temperature of measured gas (°C)

Dew point accuracy vs. measurement conditions

Response time	63% [90%] at +20 °C gas temperature
Flow rate	1 l/min and 1 bar pressure
-60 ... -20 °C Td (-76 ... -4 °F Td)	5 s [10 s]
-20 ... -60 °C Td (-4 ... -76 °F Td)	45 s [10 min]

TEMPERATURE

Measurement range	0 ... +80 °C (+32 ... +176 °F)
Accuracy	±0.2 °C at room temperature
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751

RELATIVE HUMIDITY

Measurement range	0 ... 70 %RH
Accuracy (RH <10 %RH, at + 20 °C)	±0.004 %RH + 20% of reading

PPM

Measurement range (typical)	10 ... 2500 ppm
Accuracy (at + 20 °C, 1 bar)	1 ppm + 20% of reading

Other measurement parameters available (model-dependent): mixing ratio, absolute humidity, pressure dew point calculated to 1 bar, temperature difference (T-Td), water vapor pressure

Operating Environment

Operating temperature	
for probes	-40 ... +80 °C (-40 ... +176 °F)
Mechanical durability	up to +180 °C (+356 °F)
of transmitter body	-40 ... +60 °C (-40 ... +140 °F)
with display	0 ... +60 °C (+32 ... +140 °F)
Storage temperature range	-55 ... +80 °C (-67 ... +176 °F)
Pressure range for probes	see probe specifications
Sample flow rate	no effect
Measured gases	non-corrosive gases
Electromagnetic compatibility	Complies with EMC standard EN61326-1, Industrial environment
	Note: Transmitter with display test impedance of 40 ohm is used in IEC61000-4-5 (Surge immunity)

Inputs and Outputs

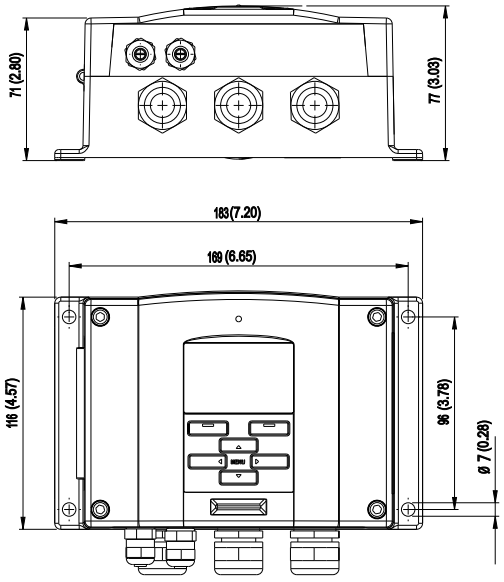
Operating voltage	10 ... 35 VDC, 24 VAC ±20 %
with optional power supply module	100 ... 240 VAC 50/60 Hz
Power consumption @ 20 °C (U_{in} 24VDC)	
RS232	max. 25 mA
U_{out} 2 x 0...1V / 0...5V / 0...10V	max. 25 mA
I_{out} 2 x 0...20 mA	max. 60 mA
display and backlight	+ 20 mA
during sensor purge	max. + 110 mA
Analog outputs (2 standard, 3rd optional)	
current output	0 ... 20 mA, 4 ... 20 mA
voltage output	0 ... 1 V, 0 ... 5 V, 0 ... 10 V
Accuracy of analog outputs at 20 °C	0.05% full scale
Temperature dependence of the analog outputs	± 0.005%/°C full scale
External loads	
current outputs	R_L < 500 ohm
0 ... 1V output	R_L > 2 kohm
0 ... 5V and 0 ... 10V outputs	R_L > 10 kohm
Max. wire size	0.5 mm² (AWG 20) stranded wires recommended
Digital outputs	RS232, RS485 (optional)
Service connection	RS232, USB
Relay outputs	0.5 A, 250 VAC, SPDT (optional)
Ethernet interface (optional)	
Supported standards	10/100Base-T
Connector	RJ45
Protocols	Telnet
WLAN interface (optional)	
Supported standards	802.11b
Antenna connector type	RP-SMA
Protocols	Telnet
Security	WEP 64/128, WPA
Authentication / Encryption	
Open / no encryption	
Open / WEP	
WPA Pre-shared key / TKIP	
WPA Pre-shared key / CCMP (a.k.a. WPA2)	
Optional data logger with real-time clock	
Logged parameters	max. three with trend/min./max. values
Logging interval	10 sec. (fixed)
Max. logging period	4 years, 5 months
Logged points	13.7 million points per parameter
Battery lifetime	min. 5 years
Display	LCD with backlight, graphical trend display of any parameter
Menu languages	English, Chinese, Finnish, French, German, Japanese, Russian, Spanish, Swedish

Mechanics

Cable bushing	M20x1.5 for cable diameter 8 ... 11mm/0.31 ... 0.43"
Conduit fitting	1/2" NPT
User cable connector (optional)	M12 series 8-pin (male)
option 1	female plug with 5 m (16.4 ft.) black cable
option 2	female plug with screw terminals
USB-RJ45 Serial Connection Cable	219685
Probe cable diameter	5.5 mm
Standard probe cable lengths	2 m, 5 m or 10 m (Additional cable lengths available, please see order forms for details)
Housing material	G-AlSi 10 Mg (DIN 1725)
Housing classification	IP 66 IP65 (NEMA4X) with local display
Weight	
depending on selected probe, cable and modules	1.0 – 3.0 kgs

Dimensions

Dimensions in mm (inches)



DRYCAP® is a registered trademark of Vaisala.

TYPE APPROVED PRODUCT
CERTIFICATE NO.: A-13529

VAISALA

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You Compress Air. We Make Sure It's Dry.

Optimize your compressed air quality with the right dew point instrument

- Fastest wet-to-dry response time on the market - just minutes
- Product range from -80°C to +60°C Td with ±2°C accuracy
- Long, 2-year calibration interval
- High resistance to contamination – immune to compressor oil
- Complete recovery from saturated conditions

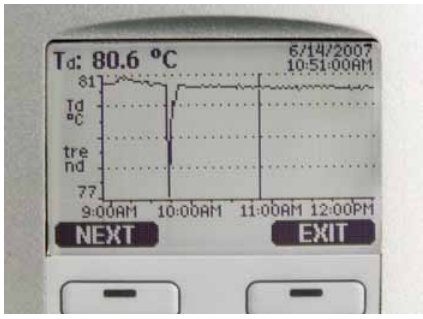
For more information, please visit:
www.vaisala.com/compressedair

www.vaisala.com/compressedair
sales@vaisala.com

VAISALA

DMT345 and DMT346 Dewpoint Transmitters for High Temperature Applications

Vaisala DRYCAP® Dewpoint Transmitters DMT345 and DMT346 are designed to measure and control humidity, especially in dry environments with high temperatures.



The large graphical display allows the user to check data at a glance.

The Vaisala DRYCAP® Dewpoint Transmitters DMT345 and DMT346 are designed for humidity measurement in industrial drying applications with particularly high temperatures.

Both transmitters incorporate the Vaisala DRYCAP® sensor, which is accurate, reliable, and stable. The sensor is condensation-resistant and is immune to particulate contamination, oil vapor, and most chemicals. The DRYCAP® sensor is notable for its swift response time and rapid recovery after getting wet.

Measure Humidity Directly in Hot Processes

The DMT345 and DMT346 are built for direct measurement in hot processes. Therefore, there is no need for sampling systems and trace heating. As a result, high measurement accuracy and constancy are maintained.

The accuracy and stability of the DMT345 and the DMT346 are due to their unique auto-calibration function, developed by Vaisala. This feature allows the transmitter to perform calibration and adjustment by itself while the measured process is running. If the measurement accuracy is not confirmed, corrections are made automatically. The procedure is so quick and corrections so minor that it causes no disruption, ensuring easy maintenance and high performance. In normal conditions, it is recommended to have a traceable calibration performed once a year.

DMT345: Accurate in Hot and Dry Environments

The DMT345 is designed for accurate humidity measurement in hot and dry conditions. This model provides unmatched dry-end measurement accuracy at temperatures up to 140 °C; however, it can operate safely at temperatures up to 180 °C.

Features/Benefits

- The DMT345 measures humidity at temperatures up to 180 °C (356 °F)
- The DMT346 measures humidity at temperatures up to 350 °C (+662 °F)
- Dew point accuracy ±2 °C (±3.6 °F)
- Vaisala DRYCAP® sensor provides accurate and reliable measurement with excellent long-term stability and fast response time
- Condensation-resistant
- Unique auto-calibration feature
- NIST traceable calibration (certificate included)
- Graphical display and keypad for convenient operation
- Optional alarm relays and mains power supply module
- Analog outputs, RS232/485, WLAN/LAN
- MODBUS protocol support (RTU/TCP)

The stainless steel probe is especially designed for high temperatures and has an optional installation flange for easy adjustment of the probe's installation depth and, therefore, more precise positioning.

DMT346: Reliable in Very Hot Processes

The DMT346 provides the best measurement performance at process temperatures between 140 °C and 350 °C.

The DMT346 includes a cooling set as standard. The cooling effect can be regulated by adding the cooling fins, or they can be removed from the set for optimal measurement performance.

The cooling system has no moving parts, and requires no additional power or cooling utilities, so there is no risk of sensor damage due to mechanical cooling failure.

Additionally, sensor warming minimizes the risk of condensation accumulating on the sensor. In low humidity conditions the combination of auto-calibration and DRYCAP® ensures accurate measurement.

Graphical Display of Measurement Data and Trends for Convenient Operation

The DMT345 and DMT346 transmitters feature a large numerical and graphical display with a multilingual menu and keypad. It allows users to easily monitor operational data, measurement trends, and access measurement history for the past 12 months.

The optional data logger, with real-time clock, makes it possible to generate over four years of measurement history and zoom in on any desired time or time frame.

The display alarm allows tracking of any measured parameter, with freely configurable low and high limits.

Versatile Outputs and Data Collection

DMT345 and DMT346 transmitters can support up to three analog outputs; an isolated galvanic power supply and relay outputs are also available.

For serial interface the USB connection, RS232, and RS485 can be used.

DMT345 and DMT346 are also capable of applying the MODBUS communication protocol and, together with an appropriate connection option, provide either MODBUS RTU (RS485) or MODBUS TCP/IP (Ethernet) communication.

The data logger, with real-time clock and battery backup, guarantees reliable logging of measurement data for over four years. The recorded data can be viewed on the local display or transferred to a PC with Microsoft Windows® software. The transmitter can also be connected to a network with an optional (W)LAN interface, which enables a (wireless) Ethernet connection. A USB service cable makes it easy to connect the DMT345/346 to a PC via the service port.

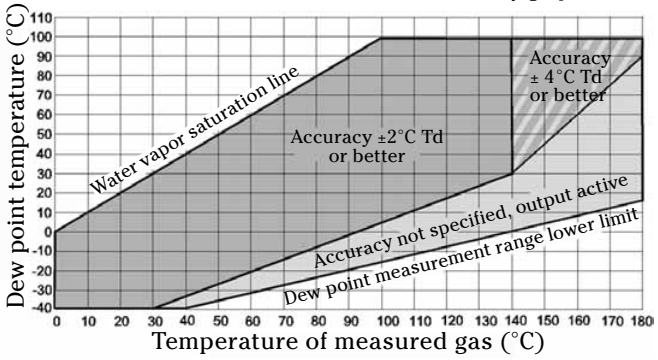
Units are delivered installation-ready.

Technical Data

Measured Variables DMT345

DEW POINT DMT345

Sensor	Vaisala DRYCAP®180S
Measurement range	-40 ... +100 °C (-40 ... +212 °F) Td
Accuracy	±2°C (±3.6 °F) Td
	See the accuracy graph below



Dew point accuracy vs. measurement conditions

Response time 63% [90%] flow rate 1 l/min and 1 bar pressure	
from dry to wet	5 s [10 s]
from wet to dry including auto-calibration	45 s [5 min]

TEMPERATURE DMT345

Measurement range	0 ... +180 °C (+32 ... +356°F)
with sensor warming	upper range limited by humidity (at 80 %RH warming is switched on and T reading not actual process temperature)
Accuracy	±0.4 °C at 100 °C
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751

RELATIVE HUMIDITY DMT345

Measurement range	0 ... 100 %RH
with sensor warming	0 ... 80 %RH
Accuracy	
below 10 %RH	±10% of reading
above 10 %RH	±1.5 %RH + 1.5% of reading

MIXING RATIO DMT345

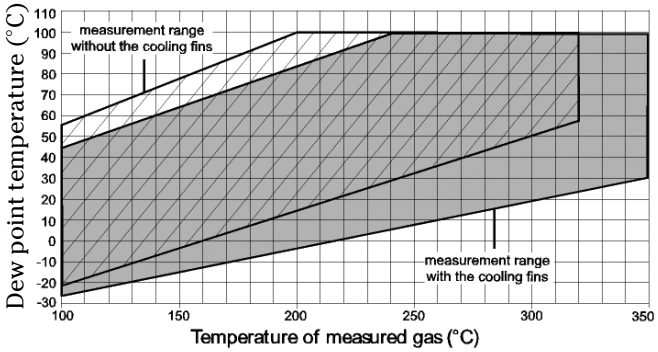
Measurement range (typical)	0 ... 1000 g/kg (0 ... 7000 gr/lbs)
Accuracy (typical)	±12% of reading

Technical Data

Measured Variables DMT346

DEW POINT DMT346

Sensor	Vaisala DRYCAP®180S
Measurement range	-25 ... +100 °C (-13 ... +212 °F) Td
Accuracy	±2 °C (±3.6 °F) Td
	See the accuracy graph below



Dew point accuracy vs. measurement conditions

Response time 63% [90%] flow rate 1 l/min and 1 bar pressure	
from dry to wet	5 s [10 s]
from wet to dry including auto-calibration	45 s [5 min]

MIXING RATIO DMT346

Measurement range (typical)	0 ... 1000 g/kg (0 ... 7000 gr/lbs)
Accuracy (typical)	±12% of reading

Operating Environment, DMT345 and DMT346

Mechanical durability	up to +180 °C (+356 °F) for DMT345
of probes	up to +350 °C (+662 °F) for DMT346
of transmitter body	-40 ... +60 °C (-40 ... +140 °F)
with display	0 ... +60 °C (32 … +140 °F)
Storage temperature range	-55 ... +80 °C (-67 … +176 °F)
Pressure range for probes	slight pressure difference (~ 200 mbar)
Measured gases	non-corrosive gases
Electromagnetic compatibility	Complies with EMC standard EN61326-1, Industrial environment
	Note: Transmitter with display test impedance of 40 ohm is used in IEC61000-4-5 (Surge immunity)

Inputs and Outputs, DMT345 and DMT346

Operating voltage	10 ... 35 VDC, 24 VAC ±20%
with optional power supply module	100 ... 240 VAC 50/60 Hz
Default start-up time	
initial reading after power-up	3 s
full operation after sensor purge and autocalibration	about 6 min
Power consumption @ 20 °C (U_{in} 24 VDC)	
U_{out} 2x0 ... 1V/0 ... 5V/0 ... 10V	max. 25 mA
I_{out} 2x0 ... 20mA	max. 60 mA
RS232	max. 25 mA
display and backlight	+ 20 mA
during sensor purge	max. + 110 mA
Analog outputs	(2 standard, 3rd optional)
current output	0 ... 20 mA, 4 ... 20 mA
voltage output	0 ... 1 V, 0 ... 5 V, 0 ... 10 V
Accuracy of analog outputs at 20 °C	± 0.05% full scale
Temperature dependence of analog outputs	± 0.005%/°C full scale
External loads	
current outputs	R_L< 500 ohm
0 ... 1V output	R_L > 2 kohm
0 ... 5V and 0 ... 10V outputs	R_L > 10 kohm
Max. wire size	0.5 mm² (AWG 20) stranded wires recommended
Digital outputs	RS232, RS485 (optional)
Protocols	ASCII commands, MODBUS RTU
Service connection	RS232, USB
Relay outputs 2+2 pcs (optional)	0.5 A, 250 VAC, SPDT
Ethernet interface (optional)	
Supported standards	10BASE-T, 100BASE-TX
Connector	8P8C (RJ45)
IPv4 address assignment	DHCP (automatic), static
Protocols	Telnet, MODBUS TCP/IP
WLAN interface (optional)	DHCP (automatic), static
Supported standards	802.11b
Antenna connector type	RP-SMA
IPv4 address assignment	DHCP (automatic), static
Protocols	Telnet, MODBUS TCP/IP
Security	WEP 64/128, WPA WPA2/802.11i
Authentication / Encryption (WLAN)	
Open / no encryption	
Open / WEP	
WPA Pre-shared key / TKIP	
WPA Pre-shared key / CCMP (a.k.a. WPA2)	
Optional data logger with real-time clock	
Logged parameters	max. four with trend/min/max values
Logging interval	10 sec. (fixed)
Max. logging period	4 years, 5 months
Logged points	13.7 million points per parameter
Battery lifetime	min. 5 years
Display	LCD with backlight, graphical trend display
Menu languages	English, Chinese, Finnish, French, German, Japanese, Russian, Spanish, Swedish

Mechanics, DMT345 and DMT346

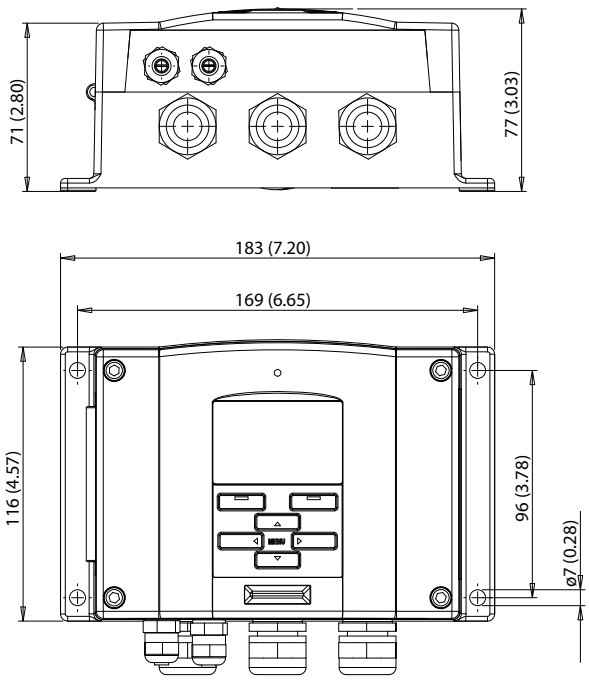
Cable bushing	M20x1.5 for cable diameter 8 ... 11mm/0.31 ... 0.43"
Conduit fitting (optional)	1/2"NPT
User cable connector (optional)	M12 series 8-pin (male)
option 1	female plug with 5 m (16.4 ft.) black cable
option 2	female plug with screw terminals
USB-RJ45 Serial Connection Cable	219685
Probe cable diameter	5.5 mm
Standard probe cable lengths	2 m, 5 m or 10 m (Additional cable lengths available, please see order forms for details)
Housing material	G-AlSi 10 Mg (DIN 1725)
Housing classification	IP 66 IP65 (NEMA4X) with local display
Weight depending on selected probe, cable, and modules	1.0 – 3.0 kgs

Technical Data

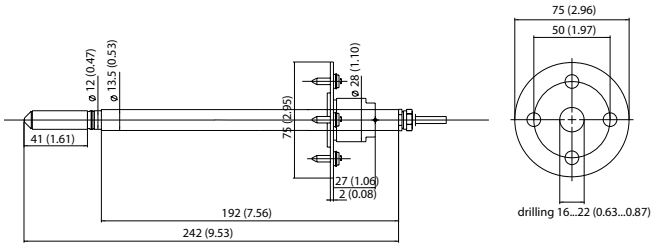
Dimensions

Dimensions in mm (inches)

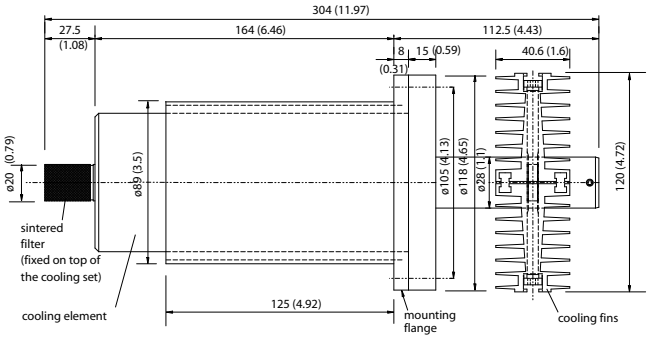
DMT345 and DMT346 transmitter housing



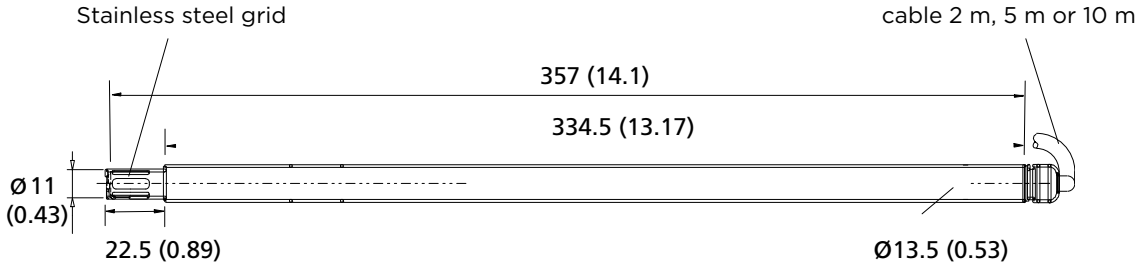
DMT345 probe and mounting flange



DMT346 cooling set



DMT346 probe



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DMT242 Dewpoint Transmitter for OEM Applications

Due to its wide measurement range and high long-term stability, the DMT242 is an ideal choice for low dew point industrial applications such as compressed air dryers, plastic dryers and other OEM applications.

Features/Benefits

- Ideal choice for industrial dryer applications
- Incorporates advanced Vaisala DRYCAP® Sensor and enhanced auto-calibration software
- Long-term stability in low dew points
- Fast response time
- Two sensor options cover dew point measurement range from -60 ... +60 °C (-76 ... +140 °F) with an accuracy of ±2 °C (±3.6 °F)
- Withstands condensation
- NIST traceable (certificate included)
- Compatible with Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70

Vaisala DRYCAP®

The Vaisala DRYCAP® Dewpoint Transmitter DMT242 provides reliable and stable measurements for industrial dryer applications. It is designed for extreme conditions.

DMT242 incorporates the Vaisala DRYCAP® thin film polymer sensor and auto-calibration software. The standard sensor choice for dry gases and desiccant dryers is DRYCAP® 180M and for more humid applications such as refrigeration dryers, a DRYCAP® 180S sensor.

Both the sensors are immune to particulate contamination, water condensation, oil vapor and most chemicals. Because the sensor withstands condensation, its performance is unmatched for low dew point applications that experience process water spikes, such as pipeline condensation during a system failure or start-up.

The auto-calibration software works on-line while the process is running. If the measurement accuracy is not confirmed, corrections are made automatically. The DMT242 adjusts the measurement, corrects dry-end drifts and continues to function. Calibration occurs quickly, and with corrections so minor, it will go unnoticed.

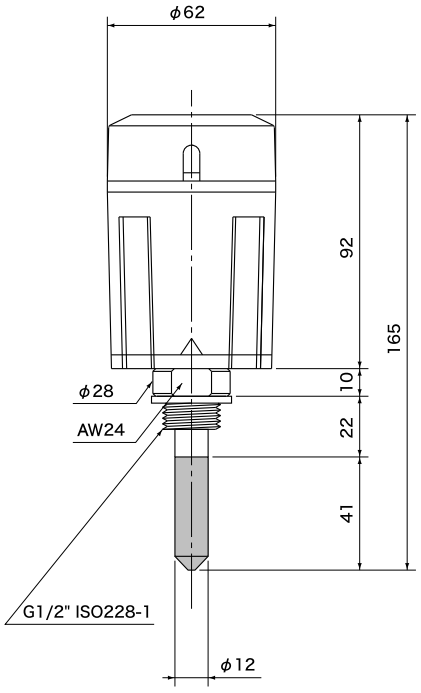
Compact, Rugged and Intelligent

Due to its compact size, DMT242 is quickly and easily installed in tight spaces.

Users can perform a field-check by using the Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70. The transmitter can be sent to Vaisala Service for NIST traceable calibration. The recommended calibration interval is every two years.

Dimensions

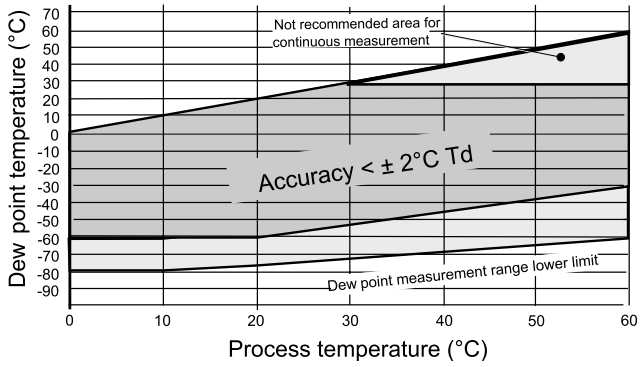
Dimensions in mm (inches)



Technical Data

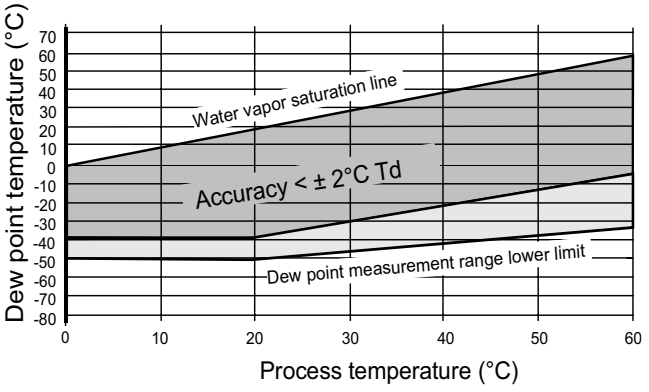
Dew Point Temperature

Measurement range (typical)	-60 ... +60 °C (-76 ... +140 °F)
Analog output scalings	
Option A	-80 ...+20 °C (-112 ...+68 °F) T_d
Option B	-60 ...+60 °C (-76 ...+140 °F) T_d
Option X	free scaling
(when the dew point is below 0 °C (32 °F), the transmitter outputs frost point)	
Accuracy with DRYCAP® 180M	±2 °C (±3.6 °F) (see graph below)



DEW POINT ACCURACY VS. MEASUREMENT CONDITIONS

Response time 63 % [90 %] at +20 °C gas temperature	
Flow rate >1 l/min and 1 bar pressure	
-60 -> -20 °C Td (-76 -> -4 °F Td)	5 s [10 s]
-20 -> -60 °C Td (-4 -> -76 °F Td)	45 s [10 min]
Accuracy with DRYCAP® 180S	±2 °C (±3.6 °F) (see graph below)



Operating Environment

Temperature	0 ... +60 °C (32 ... +140 °F)
higher temperature peaks	Short-term OK
Relative humidity	0 ... 100 %RH
Pressure	0 ... 20 bara (0 ... 290 psia)
Sample flow rate	no effect

Output

Analog output	4 ...20 mA
Resolution for analog output	±0.002 mA
Typical temperature dependence	0.0008 mA/ °C
Serial line for service use	RS232

General

Sensor	DRYCAP® 180M
Optimal sensor for refrigeration dryers	DRYCAP® 180S
Operating voltage	18 - 35 VDC, 20 - 28 VAC
Power consumption at 24 VDC	max. 220 mA
External load for analog output	max. 500 Ω
Optional connection cable with DMT242 connector	2 m or 10 m
Connector for supply voltage and signal output	
max. wire size	0.75 mm^2
max. cable diameter	6.5 mm /PG7
Service cable for serial interface RS232	product code DMT242RS
Probe material (wetted parts)	stainless steel (AISI 316L)
Sensor protection	stainless steel sintered filter (HM47280)
Mechanical connection	G½" ISO228-1 thread with bonded seal ring (U-seal)
Electronics housing material	plastic (ABS/PC)
Housing classification	IP65 (NEMA4)
Storage temperature range	-40 ... +70 °C, (-40 ... +158 °F)
Complies with the EMC standard EN61326-1, Electrical equipment for measurement, control and laboratory use - EMC requirements; Industrial environment.	

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DMT152 Dewpoint Transmitter for Low Dew Point Measurement in OEM Applications

The small and powerful DMT152 measures dew point down to -80 °C.

Features/Benefits

- Compact
- Accurate
- Vaisala DRYCAP® technology with a polymer sensor
- Measures dew point down to -80 °C (-112 °F)
- Reduced maintenance costs due to long calibration interval
- Fast response time
- Withstands condensation
- NIST traceable
- Applications: compressed air, plastics drying, dry chambers, pure gases, and high-voltage circuit breakers

The Vaisala DRYCAP® Dewpoint Transmitter DMT152 is designed for measuring low dew point in OEM applications, even down to -80°C . The excellent long-term stability and reliability of its performance is based on the latest DRYCAP® polymer sensor technology.

Low Maintenance

The DMT152 mechanics have been designed for harsh environments requiring protection against dust, dirt, and splashed water.

The DRYCAP® technology has a low maintenance need due to its excellent long-term stability and durability against condensation.

Applications

The DMT152 is an ideal choice for industrial applications where it is necessary to control very low humidity. Most typical areas of use are air and plastics dryers, dry chambers, pure gases, and highvoltage circuit breakers.

The DMT152 measures accurately and reliably also in the challenging combination of low humidity and hot air, which is typical in plastics drying.

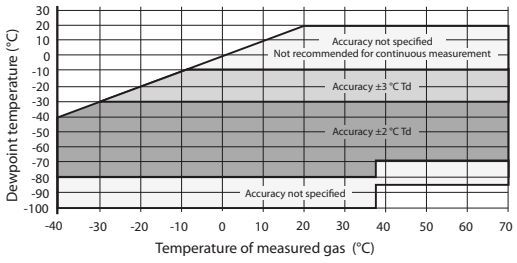
Technical Data

Measured Variables

DEW POINT TEMPERATURE

Measurement range	-80 ... -10 °C (-112 ... +14 °F)T_d
Accuracy	
-80 ... -30 °C (-112 ... -22 °F)	±2 °C (3.6 °F) T_d
-30 ... -10 °C (-22 ... +14 °F)	±3 °C (5.4 °F) T_d
Non-calibrated range	-100 ... -80 °C, -10 ... +20 °C T_d (-148 ... -112 °F, +14 ... +68 °F T_d)
Analog output scalings	
option 1	-80 ... +20 °C (-112 ... +68 °F) T_d
option 2	-100 ... 0 °C (-148 ... +32 °F) T_d
option 3	user-specified output scaling
when dew point is below 0 °C (32 °F) the transmitter outputs frost point	

Accuracy over temperature range



Response time 63 % [90 %] at a gas temperature of +20 °C (+68 °F) and pressure of 1 bar	
-10 ... -80 °CTd	0.5 min [7.5 min]
-80 ... -10 °CTd	2 s [5 s]
Typical long-term stability	better than 2 °C (3.6 °F) /year

PPM VOLUME CONCENTRATION

Measurement range (typical)	0 ... 500 ppm
Accuracy at +20 °C (+68 °F), 1013 mbar	±(0.2 ppm + 20 % of reading)

Operating Environment

Temperature	-40 ... +70 °C (-40 ... +158 °F)
Relative humidity	0 ... 100 %RH (up to + 20 °C/68 °F)
Pressure	0 ... 50 bar (725 psia)
Measured gases	non-corrosive gases
Sample flow rate	no effect on measurement accuracy

Outputs

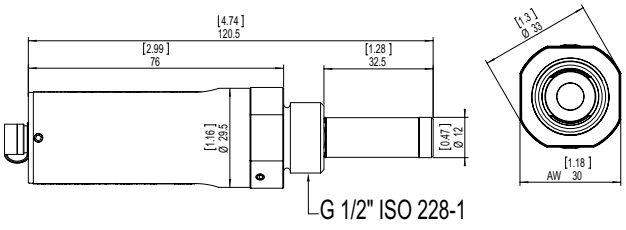
Two analog outputs (scalable)	4 ... 20 mA, 0 ... 20 mA (3 wire) 0 ... 5 V, 0 ... 10 V
Accuracy of analog outputs	± 0.01 V / ±0.01 mA
Digital output	RS485 (2-wire)
Alarm-level indication by analog signal	user selectable
Purge information	5 V, 10 V, 20 mA or LED

General

Sensor	Vaisala DRYCAP® 180U Thin-film capacitive polymer sensor
Recommended calibration interval	2 years
Operating voltage with	
RS485 output	11* ... 28 VDC
voltage output	15* ... 28 VDC
current output	21 ... 28 VDC
*For extended temp. down to -40 °C (-40 °F) or pressure up to 50 bar (725 psia), the supply voltage is 21 ... 28 VDC.	
Supply current	
normal measurement	20 mA + load current
during self-diagnostics	max. 220 mA pulsed
Supply voltage fluctuation	max. 0.3 V
External load for	
voltage output	min. 10 kOhm
current output	max. 500 Ohm
Housing material (wetted parts)	AISI316L
Stainless steel mesh filter	Filter body AISI303, mesh AISI316L, grade 18 µm
Mechanical connections	ISO G½", NPT ½", UNF 3/4"- 16"
Housing classification	IP65 (NEMA 4)
Storage temperature range	-40 ... +80 °C (-40 ... +176 °F)
Weight (ISO G½")	190 g (6.70 oz)
Complies with EMC standard EN61326-1, Electrical equipment for measurement control and laboratory use - EMC requirements; Industrial environment	

Accessories

Connection cable for MI70 hand-held indicator	219980
USB cable for pc connection	219690
Sampling cells (available for ISO G½")	
basic sampling cell	DMT242SC
with Swagelok 1/4" male connectors	DMT242SC2
with a quick connector and leak screw	DSC74
two-pressure sampling cell	DSC74B
NW40 flange	225220SP



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DMT143 Miniature Dewpoint Transmitter for OEM Applications

The Vaisala DRYCAP® Dewpoint Transmitter DMT143 is an ideal choice for small compressed air dryers, plastic dryers and other OEM applications.

Features/Benefits

- Miniature size dew point transmitter for e.g. small industrial dryer applications
- Vaisala DRYCAP® technology with auto-calibration
- Calibration interval of two years
- Dew point measurement range -60...+60 °C (-76...+140 °F)
- Accuracy ±2 ºC (±3.6 ºF)
- Withstands condensation
- Fast response time
- Compatible with Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70
- NIST traceable calibration (certificate included)
- Easy servicing and data transfer via the RS485 user interface
- LED alarm for exceeded dew point level

Vaisala DRYCAP®

The Vaisala DRYCAP® Dewpoint Transmitter DMT143 is a miniature dew point measurement instrument. The transmitter can be installed directly into pressurized systems at 50 bar (725 psia) maximum pressure. The long-term high performance is achieved with Vaisala DRYCAP® technology.

The sensor fully withstands getting wet, and therefore, the transmitter performs exceptionally well in applications that occasionally experience process water spikes, such as pipeline condensation during a system failure or start-up. The sensor is also highly resistant to particulate contamination, oil vapor and most chemicals, and is insensitive to the flow rate.

Long Calibration Interval

The calibration interval of the DMT143 is two years. Additionally, the Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70 can be used to confirm the performance of the DMT143 without disconnecting the transmitter. For any adjustment needs, the transmitter can be sent to Vaisala Service.

The auto-calibration software works on-line while the process is running. If the measurement accuracy is not confirmed, corrections are made automatically.

Easy Installation

The DMT143 has a variety of features to choose from, including different output, installation options and alarm LED.

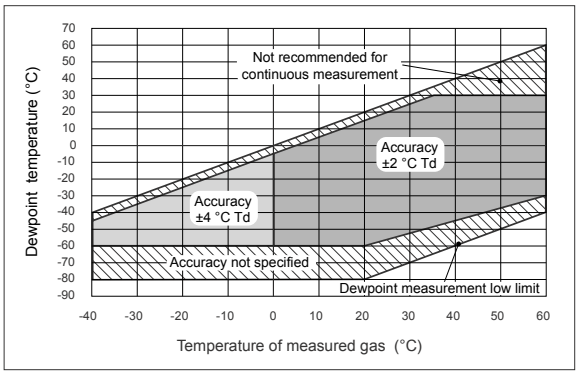
Due to its small size and light weight, the DMT143 is quickly and easily installed in tight spaces or in small-size pipelines. The alarm LED indicates too high dew point in the process. The trigger point is preset at the factory. It can be later adjusted with the Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70 or a PC.

Technical Data

Measured Parameters

DEW POINT TEMPERATURE	
Measurement range(typical)	-60 ... +60 °C (-76 ... +140 °F) T_d
Analog output scalings	
option 1	-80 ...+20 °C (-112 ... +68 °F) Td
option 2	-80 ...+20 °C (-112 ... +68 °F) T_d dew point at ambient pressure
option 3	free scaling
Accuracy in air or N2	±2 °C (±3.6 °F) T_d (see graph below)
when the dew point is below 0 °C (32 °F), the transmitter outputs frostpoint	

Technical Data


Dewpoint temperature (°C)
Temperature of measured gas (°C)
Not recommended for continuous measurement
Accuracy ±2 °C Td
Accuracy ±4 °C Td
Accuracy not specified
Dewpoint measurement low limit

Dew point accuracy vs. measurement conditions

Response time 63% [90%] at +20 °C gas temperature and 1 bar pressure	
-60 -> -20 °C T_d (-76 -> -4 °F T_d)	5 s [15 s]
-20 -> -60 °C T_d (-4 -> -76 °F T_d)	45 s [10 min]
PPM VOLUME CONCENTRATION	
Measurement range (typical)	10 ... 40000 ppm
Accuracy at +20 °C (+68 °F), 1 bar	1 ppm + 20% of reading

Operating Environment

Measured gases	non-corrosive gases
Temperature *)	-40 ... +60 °C (-40 ... +140 °F)
Relative humidity	0 ... 100 %RH
Pressure *)	0 ... 50 bar_a (725 psia)
Sample flow rate	no effect for measurement accuracy

*) For extended temperature below 0 °C (+32 °F) or pressure above 20 bar_a (290 psia) the supply voltage must be 24 ... 28 VDC.

Outputs

Analog output (scalable)	4 ... 20 mA (3-wire), 0 ... 1 V/5 V, 1 ... 5 V
Resolution for current output	0.002 mA
Resolution for voltage output	0.3 mV
Typical temperature dependence	0.005 % of span / °C
Digital output	RS-485, non-isolated Vaisala Industrial Protocol
Connector	4-pin M8 (IEC 60947-5-2)

General

Sensor	Vaisala DRYCAP® 180D
Recommended calibration interval to confirm the specified accuracy	2 years
Operating voltage with voltage output	12 ... 28 VDC
Operating voltage with current output	18 ... 28 VDC
Supply current	
normal measurement	max 10mA + load current
during self-diagnostics	max. 220 mA pulsed
Load for current output	max. 500 Ohm
Load for voltage output	min. 10 kOhm
Housing material	stainless steel (AISI316L)
Sensor protection	stainless steel sintered filter
Mechanical connection	ISO G1/2" or NPT 1/2
Housing classification	IP66 (NEMA 4)
Storage temperature range	-40 ... +60 °C (-40...+140 °F)
Weight	G-thread version 90g (3.2oz) NPT-thread version 100g (3.5oz)

Complies with EMC standard EN61326-1, Electrical equipment for measurement, control and laboratory use - EMC requirements - Industrial environment.

Accessories

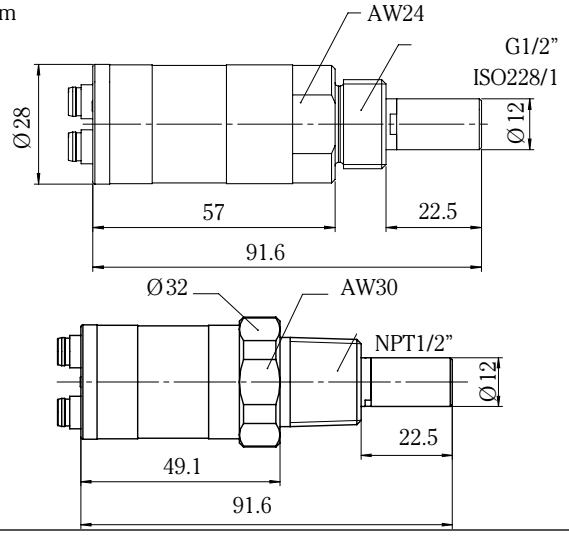
Connection cable for DM70	219980SP
USB connection cable	219690
Sampling cells	
basic sampling cell	DMT242SC
with Swagelok 1/4" male connectors	DMT242SC2
with quick connector and leak screw	DSC74SP
two-pressure sampling cell	DSC74BSP
cooling/venting coil	DMCOILSP

See DM70 / Portable Sampling Systems and Sampling Cells for further information about sampling cells available

Loop powered external display	226476
Loop powered external display with relays	234759

Dimensions

in mm



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DMT132 Dewpoint Transmitter for Refrigerant Dryers

The optional LED warning light tells the user when the defined dew point limit has been exceeded.

Features / Benefits

- Affordable dew point transmitter for refrigerant dryers
- High accuracy ±1°C (±1.8°F) in the measurement range of refrigerant dryers
- Excellent long-term stability - resistant to compressor oil and most other chemicals thanks to HUMICAP® technology
- Low power requirements, 10 ... 28 VDC
- Easy to verify functionality with compatible hand-held meters DM70 or HM70
- Optional LED warning light

The Vaisala HUMICAP® Dewpoint Transmitter DMT132 is an affordable dew point measurement instrument designed to verify the functionality of refrigerant dryers. It is especially well suited for OEM dryer manufacturers.

Direct Measurement Cuts Costs

Direct outlet air dew point measurement provides accurate information about dryer functionality and is more reliable than the traditional method of measuring refrigerator temperature only. Knowledge of the real dew point ensures high quality compressed air at all times and enables customers to optimize dryer capacity. This helps to prevent investment in redundant dryer capacity and avoid unnecessary maintenance and costly malfunctions.

High Accuracy and Long-Term Stability

The DMT132 provides optimal performance in the operating range of refrigerant dryers. In the measurement range of -3 … 20 °C (+26.6 … +68 °F), where the refrigerator dryers typically operate, the Td accuracy is ±1°C (±1.8°F). The instrument incorporates the proven Vaisala HUMICAP® sensor, which is resistant to compressor oil and most other chemicals, thereby providing excellent long-term stability.

Quick Installation and Easy Field Checking

It takes just a few minutes to install the DMT132 directly into a dryer or compressed air line through a G1/2" ISO thread. Vaisala sampling cells can also be used. The loop-powered electronics mean that wiring is easy and power requirements are low. The DMT132 operating voltages can be as low as 10 VDC.

Verifying the performance of the DMT132 is easy with the compatible Vaisala hand-held DM70 or HM70 meters. The user can perform possible adjustments with the Vaisala HMK15 Humidity Calibrator.

Demand for dew point sensors to verify refrigerant dryers is increasing. Direct dew point measurement enables energy savings and improved efficiency.

Technical Data

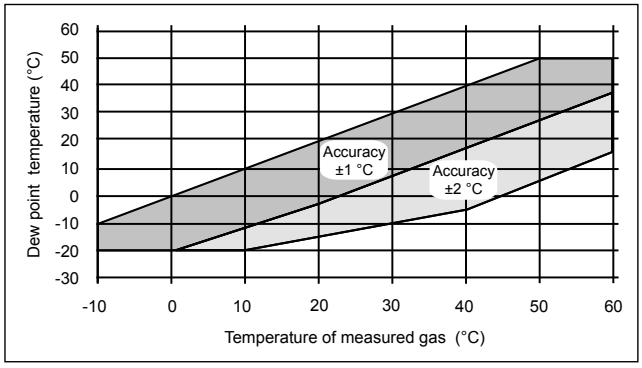
Performance

DEW POINT	
Measurement range	-20 ... +50 °C (-4 ... +122 °F) Td
Accuracy (at +20 °C (+68 °F)	±1 °C for -3...20 °C (+26.6 ... +68 °F) Td
	±2 °C for -15...-3 °C (+5 ... +26.6 °F) Td
	see accuracy graph below

* when dew point is below 0 °C (+32 °F), the transmitter outputs frostpoint

Response time at 20 °C (+68 °F) gas temperature and 1 bar pressure	
-14 -> +3 °C (+7 -> +37 °F) Td	17 s (63%)
	40 s (90%)
+3 -> -14 °C (+37 -> +7 °F) Td	33 s (63%)
	85 s (90%)

CALCULATED VARIABLES	
Dew point converted to atmospheric pressure	Tdf atm



Operating Environment

Operating temperature	-10 ... + 60 °C (+14 ... +140 °F)
Operating pressure	0 ... 20 bar
Relative humidity	0 ... 100 %RH
Sample flow rate	no effect on measurement accuracy
Measured gases	non-corrosive gases

Outputs

Analog output (scalable)	4...20 mA, 2-wire
Resolution for current output	0.002 mA
Accuracy of analog outputs at +20 °C	±0.05% full scale
Typical temperature dependence	±0.005% of full scale/ °C
Connector	4-pin M8 (IEC 60947-5-2)
LED indication available for defined dew point limit/ error state indication	
RS485 serial line for service use	

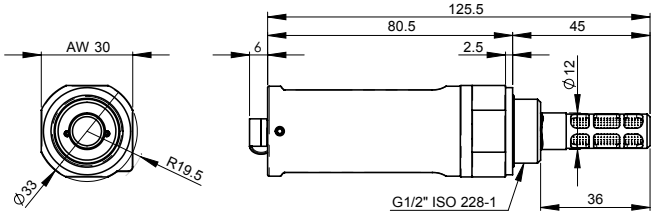
General

Sensor	Vaisala HUMICAP®180R
Recommended calibration interval (in refrigerant dryer application)	2 years
Mechanical connection	G 1/2" ISO
Operating voltage	10 .... 28 VDC
External load	max 100 ohm for supply voltages <20 VDC max 500 ohm for supply voltages 20...28 VDC
Weight	65 g (2.3 oz)
Housing material	PPS + 40% GF
Housing classification	IP65 (NEMA 4)
Storage temperature range	-40 ... + 80 °C (-40 ... +176 °F)
Start-up time	3 s

Complies with EMC standard EN61326-1, Electrical equipment for measurement control and laboratory use - EMC requirements; Industrial environment

Options and Accessories

Tube filter	230602
Special cover set for HMK15 (calibrator fitting DMT132 and HMP60)	230914
NPT Adapter	210662SP
Sample cells	DMT242SC, DMT242SC2, DSC74, DSC74B, DSC74C, DMCOIL
Duct installation flange	DM240FA
Cables (several lengths available)	HMP50Z032, HMP50Z300SP, HMP50Z500SP, HMP50Z1000SP
Loop powered external display	226476
USB Service cable	219690
Connection cable to DM70/HM70	219980
LED plug	230388
ISO" 1/2 plug	218773
NPT1/2" plug	222507
Sealing ring set (3 pcs U-seal)	221525SP



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DM70 Hand-Held Dewpoint Meter for Spot-Checking Applications

The Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70 offers accurate and fast measurement for industrial dew point applications, such as compressed air, metal treatment and plastics drying.

Features/Benefits

- Designed for industrial spot-checking and field calibration
- Three models: accurate measurement ranges from -60 to +60 °C (-76 ... +140 °F)
- Vaisala DRYCAP® Sensor with patented autocalibration function
- Low maintenance need due to superior long-term stability
- Sensor withstands condensation
- Fast response, enhanced by Sensor Purge option
- Easy-to-use user interface
- Data can be logged and transferred to a PC via MI70 Link software
- Compact, small and light
- NIST traceable (certificate included)

The Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70 measures dew point temperature accurately over a wide measurement range. The probe may be inserted directly into pressurized processes, and it responds rapidly from ambient to process conditions. The sensor withstands condensation and fully recovers from getting wet.

Three probe models, all with auto-calibration, are available. The A and B models are both general purpose probes. The C model is specifically developed for SF_6 gas. The B and C probe models have an additional Sensor Purge feature that heats and dries the sensor, making the response from ambient to dry conditions exceptionally fast.

The DM70 is fitted with the Vaisala DRYCAP® Sensor. The sensor provides reliable, stable and high-performance dew point measurement. Autocalibration detects on-line possible measurement inaccuracies and automatically corrects dry-end drift in the calibration curve.

The DM70 has a versatile and easy-to-use, menu-based user interface, a clear graphical LCD display, and data-logging capability. It can also be used as a tool for reading the output of fixed Vaisala dew point transmitters, like the DMT242, DMT132, DMT142, DMT152 and DMT340.

The DM70 displays one to three parameters at a time, either numerically or graphically. Several humidity units can be selected. In addition, the DM70 includes conversion from gas pressure dew point to ambient pressure dew point. An analog output is also available.

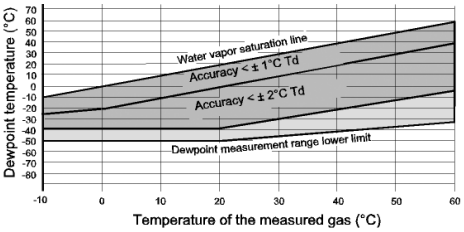
The DM70 meter is suitable for direct process dew point measurement in a wide temperature and pressure range. For more demanding applications, the DM70 can be used with the Vaisala sampling cell adapters, or with the Vaisala DRYCAP® Sampling System DSS70A.

Technical Data

Measured Variables, DMP74A Probe

DEW POINT

Measurement range (typical)	-50 ... +60 °C (-58 ... +140 °F)
Accuracy (A probe) -40...+60 °C	±2 °C (±3.6 °F) (see graph)



Dew point accuracy vs. measurement conditions

Response time

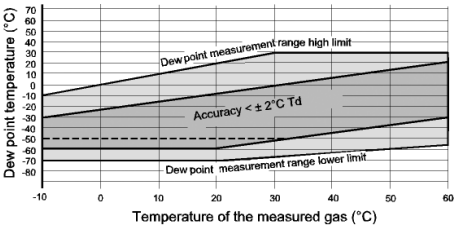
flow rate 0.2 m/s, 1 bar pressure, +20 °C (+68 °F)	63% [90%]
0 -> -40 °C T_d (32 -> -40 °F T_d)	20 s [120 s]
-40 -> 0 °C T_d (-40 -> 32 °F T_d)	10 s [20 s]
Dew point sensor	Vaisala DRYCAP® 180S

Technical Data

TEMPERATURE	
Measurement range	-10 ... +60 °C (+14 ... +140 °F)
Accuracy at +20 °C (+68 °F)	±0.2 °C (±0.36 °F)
Typical temperature dependence of electronics	±0.005 °C/°C (±0.005 °F/°F)
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751
OTHER VARIABLES AVAILABLE	
Dew point converted to atmospheric pressure, ppm volume and ppm weight concentration, absolute humidity, mixing ratio, relative humidity	

Measured Variables, DMP74B and DMP74C (for SF6 gas) Probes

DEW POINT	
Measurement range (typical)	-70 ... +30 °C (-94 ... +86 °F)
Accuracy (B and C probe) -60...+20 °C	±2 °C (±3.6 °F) (see graph)


Dew point temperature (°C)
Dew point measurement range high limit
Accuracy < ± 2°C Td
Dew point measurement range lower limit
Temperature of the measured gas (°C)

Dew point accuracy vs. measurement conditions

Dotted line:
For DMP74C the ±2 °C accuracy range is limited to -50 °C T_d when used in SF6 gas.

Response time	
flow rate 0.2 m/s, 1 bar pressure, +20 °C (+68 °F)	63% [90%]
0 -> -60 °C T_d (32 -> -76 °F T_d)	50 s [340 s]
-60 -> 0 °C T_d (-76 -> 32 °F T_d)	10 s [20 s]
Dew point sensor	Vaisala DRYCAP® 180M
TEMPERATURE	
Measurement range	-10 ... +60 °C (+14 ... +140 °F)
Accuracy at +20 °C (+68 °F)	±0.2 °C (±0.36 °F)
Typical temperature dependence of electronics	±0.005 °C/°C (±0.005 °F/°F)
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751
OTHER VARIABLES AVAILABLE	
Dew point converted to atmospheric pressure, ppm volume and ppm weight concentration	

All Probe Models

Operating temperature	-10 ... +60 °C (+14 ... +140 °F)
Operating pressure	
DMP74A, DMP74B	0 ... 20 bara (0 ... 290 psia)
DMP74C	0 ... 10 bara (0 ... 150 psia)
Sample flow rate	no effect for measurement accuracy
Measured gases	non-corrosive gases
Probe material (wetted parts)	Stainless steel (AISI 316L)
Sensor protection	Sintered filter (AISI 316L) partno: HM47280
Mechanical connection	G1/2" ISO228-1 thread with bonded seal ring (U-seal)
Housing classification	IP65 (NEMA 4)
Weight	350 g

MI70 Indicator, General

Menu languages	English, Chinese, Spanish, Russian, French, Japanese, German, Swedish, Finnish,
Display	LCD with backlight Graphic trend display of any parameter Character height up to 16 mm
Max. no of probes	2
Power supply	Rechargeable NiMH battery pack with AC-adapter or 4xAA size alkalines, type IEC LR6
Analog output	0...1 VDC
Output resolution	0.6 mV
PC interface	MI70 Link software with USB or serial port cable
Datalogging capacity	2700 points
Alarm	Audible alarm function
Operating temperature range	-10...+40 °C (+14…+104 °F)
Storage temperature range	-40 ... +70 °C (-40 ... +158 °F)
Operating humidity range	0 ... 100 % RH, non-condensing
Housing classification	IP54
Housing materials	ABS/PC blend
Weight	400 g
Battery operation time with DMP74 probe	
continuous use	48 h typical at +20 °C (+68 °F)
data logging use	up to a month, depending on logging interval
Electromagnetic compatibility	EN 61326-1, Generic Environment

Accessories

Connection cables for fixed Vaisala dew point transmitters	
for DMT242 transmitter	27160ZZ
for DMT340 series	211339
for DMT152 and DMT132 transmitters	219980
for DMT142 transmitter	211917ZZ
MI70 Link software with USB cable	219687
MI70 Link software with serial port cable	MI70LINK
Analog output cable	27168ZZ
10 m (32.81 ft) extension cable for probe	213107SP
Portable Sampling System (see separate data sheet)	DSS70A

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DSS70A Portable Sampling System and Sampling Cells for DM70

The DSS70A provides a compact solution for field checking dew point where direct measurement is difficult. Typical applications for the sampling system are metal treatment and plastics drying processes.

DSS70A Portable Sampling System

The DSS70A is designed to provide dew point sampling flexibility for the DM70 hand-held dew point meter. For processes at atmospheric pressure, a battery powered pump is used to extract a gas sample. For pressurized processes up to 20 bar, the sample is measured at process pressure and then reduced to atmospheric pressure for venting or re-direction, bypassing the pump. In all cases, the sample gas passes through a filter to remove particulate contamination before measurement. Flow through the system is controlled and monitored with a needle valve and flow meter.

The DSS70A is easily connected to an appropriate sample point with tubing (typically 1/4" or 6 mm). The measured dew point must be below ambient temperature to avoid condensation in the system. Gas temperatures higher than +40 °C (+104 °F) should be cooled with a short PTFE (included in the DSS70A system) or stainless steel tube prior to entering the DSS70A. DSS70A is an accessory for DM70 Dewpoint Hand-held Meter.

Sampling Cells for Pressurized Processes

The DM70 can easily be connected to pressurized processes. In addition to direct pipeline installation, a variety of sampling cell options are available for gas sampling.

The DSC74 sampling cell is the recommended choice. It has a variety of connection adapters that allow several different ways of installation. The quick connector with a leak screw allows a very fast connection for compressed air lines. Additionally, two thread adapters are available for the inlet port.

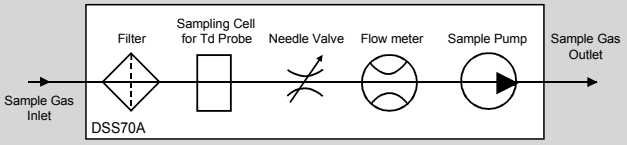
The DSC74B is a two-pressure sampling cell, which enables measurements in both process and ambient pressure. This sampling cell is especially suitable for dew point measurements in SF_6 gas with the DMP74C probe.

The DMT242SC is a basic sampling cell. The DMT242SC2 is a sampling cell supplied with welded Swagelok connectors for sampling in a 1/4" pipeline.

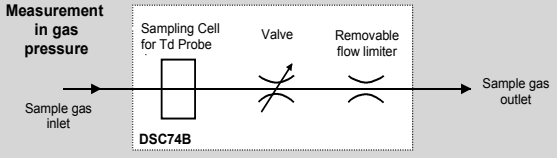
The sampling cells (from the left) DMT242SC2, DMT242SC and DSC74 can be used to connect the DM70 to sample gas flow. The DSC74B (right) is a two-pressure sampling cell that can be used for measurements in either pressurized or ambient pressure. The cooling/venting coil is included in the DSC74C sample cell, but is an option for all sampling cells.

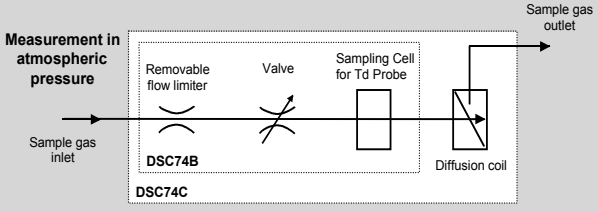
Technical Data

DSS70A Sampling System and DSC74B/C Sampling Cells



The DSS70A sampling system includes a filter to clean the dirty sample gas and a needle valve to control the sample flow rate with the flow meter. A sample pump is used to generate a sample flow from processes at ambient pressure.





The DSC74B sampling cell enables the measurement of the sampled gas either in gas pressure up to 10 bar or in atmospheric pressure depending on the gas inlet and outlet. The DSC74C is like the DSC74B but with an additional coil to avoid back diffusion, the effect of surrounding moisture, in dew point measurements in atmospheric pressure.

Sampling Cells Technical Data

DSC74	sampling cell for pressurized gases
pressure limit	1 MPa (10 barg, 145 psig)
DSC74B	two pressure sampling cell
pressure limit	1 MPa (10 barg, 145 psig)
DSC74C	DSC74B with DMCOIL cooling/venting coil
DMCOIL	cooling/venting coil
DMT242SC	sampling cell
pressure limit	10 MPa (100 barg, 1450 psig)
DMT242SC2	sampling cell with Swagelok connectors
pressure limit	4 MPa (40 barg, 580 psig)
Material for all sampling cells	stainless steel AISI316

DSS70A Sampling System Operating Conditions

Operating gases	air, N2 and other non-toxic, inert gases
Sampled gas dew point	below Tamb
Inlet/outlet connection	1/4" Swagelok
Operating temperature	
ambient temperature	0 ... +40 °C (32 ... +104 °F)
process gas temperature	
with PTFE tube at +20 °C (+68 °F) (included in the DSS70A)	max. +200 °C (+392 °F)
with stainless steel tube	specification according to stainless steel tube specification
maximum gas temperature at inlet	+40 °C (+104 °F)
Operating pressure	
with pump	0.6 ... 1.2 bara (8.7 ... 17.4 psia)
pump disconnected	0 ... 20 bara (0 ... 290 psia)

General

Battery operation time for pump	8 h continuous use
	battery can be recharged using DM70 charger
Filter	7 mm inline filter cartridge 1/4" Swagelok SS-4F-7 (spare part order no. 210801)
Materials	
wetted parts	Stainless steel
carrying case	ABS plastic
Case size (W x D x H)	430 x 330 x 100 mm
Weight	5.5 kg (12 lbs)

Electromagnetic Compatibility

EN61326-1, Generic Environment.

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DPT146 Dewpoint and Pressure Transmitter for Compressed Air

The DPT146 measures both dew point and process pressure. Monitoring compressed air is simpler and quicker, helping you to make more informed decisions.

Features/Benefits

- The first transmitter that monitors both dew point and process pressure
- A simple and convenient transmitter for monitoring of compressed air
- Highly accurate humidity information thanks to dew point data coupled with live pressure input
- Proven sensor technology
- Compatible with the Vaisala Hand-Held DM70 for easy spot checking, local display and data logging
- Pressure: 1 ... 12 bar
- Dew point: -60 ... +30 °C (-76 ... +86 °F) Tdf with accuracy of ±2°C (±3.6 °F)
- Digital output RS-485 with MODBUS

The Vaisala Dewpoint and Pressure Transmitter DPT146 for Compressed Air makes monitoring compressed air simple and convenient. The DPT146 measures both dew point and process pressure simultaneously, and is the ideal choice for anyone using or monitoring compressed air.

Simple and Efficient Installation

One transmitter providing two of the most important compressed air measurements means reduced installation costs and a much easier setup – with only one instrument needing connection and wiring.

Make More Informed Decisions

Dew point measurement combined with process pressure measurement offers further unique advantages. When dew point data is coupled with live pressure input, conversions to atmospheric pressure or ppm are available online, leaving no ambiguity in the information. As an example, regulative requirements of medical gas can be fulfilled easily and quickly.

A Unique Combination of Two World-Class Sensors

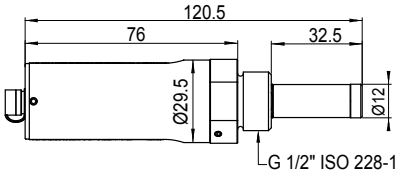
The DPT146 combines the knowledge of more than 20 years of sensor-technology development. Proven measurements from the DRYCAP® sensor for dew point and the BAROCAP® sensor for pressure are now combined into one easy-to-use transmitter.

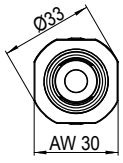
Convenience with Proven Performance

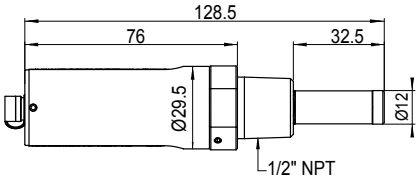
Well-developed technology brings both proven results and convenience. Spot-checking and verification of dew point is easy thanks to fully compatible Vaisala DRYCAP® Hand-Held Dewpoint Meter DM70. The DM70 can also be used as a local display and data logger. Temperature measurement is available when the RS485 is in use.

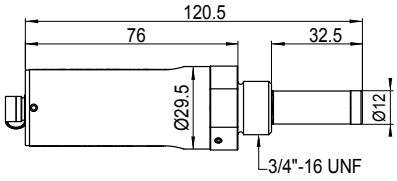
Dimensions

Dimensions in mm (inches)









Technical Data

Measured Parameters

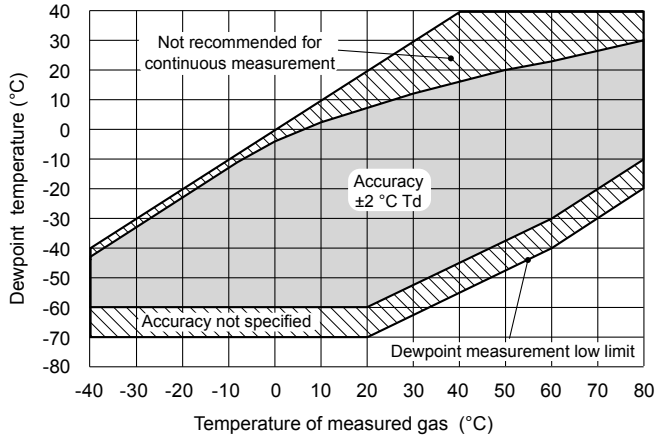
Dew point	-60 ... +30 °C (-76 ... +86 °F)
Pressure, absolute	1 ... 12 bar (14.5 ... 174 psi)
Temperature (available if output RS-485 only selected)	-40 ... +80 °C (-40 ... +176 °F)

Calculated Parameters

ppm moisture, by volume	1 ... 40 000 ppm
Dew point, converted to atmospheric pressure	-75 … +30 °C (-103 ... +86 °F)

Performance

Dew point accuracy	±2 °C (±3.6 °F)
Pressure accuracy at 23 °C (73.4 °F)	±0.4 %FS
Pressure temperature dependence	±0.01 bar / 10 °C (18 °F)
Temperature accuracy	
0 ... 40 °C (+32 ... +104 °F)	±0.5 °C (± 0.9 °F)
-40...80 °C (-40 ... +176 °F)	±1 °C (± 1.8 °F)
PPM accuracy (7 bar)	±(14 ppm + 12% of reading)
Sensor response time:	
Pressure response time	< 1 s
Dew point response time 63% [90%] at 20°C and 1 bar	
-50 -> -10 °C Tdf	5 s [10 s]
-10 -> -50 °C Tdf	10 s [2.5 min]



DPT146 Dewpoint Measurement Accuracy

Operating Environment

Operating temperature of electronics	-40 … +60 °C (-40 ... +140 °F)
Operating Pressure	0 … 50 bar (0…725 psi)
Relative humidity	0...100 %
Measured gases	Air/ non-corrosive gases
Sample flow rate	no effect on measurement accuracy

Outputs

Analog Outputs (2 channels)	
current output	0 … 20 mA, 4 … 20 mA
voltage output	0 … 5V, 0 …10V
Accuracy of analog outputs	± 0.01 V / ± 0.01 mA
Digital output	RS-485, non-isolated, Vaisala protocol,MODBUS RTU protocol
Connector	4-pin M8

General

Sensor	Vaisala MPS1 multiparameter sensor
Operating voltage	21 ... 28 VDC, current output 20 ... 28 VDC, voltage output and/or use in cold temperatures (-40 ... -20 °C (-40 ... -4 °F)) 15 ... 28 VDC, RS485 only
Supply current	
during normal measurement	20 mA + load current
during self-diagnostics	300 mA + load current
External load for	
current output	max. 500 Ohm
voltage output	min. 10 kOhm
Housing material	AISI316L
Housing classification	IP65 (NEMA4)
Sensor protection	Mesh filter AISI303, grade 18 µm
Storage temperature range	
transmitter only	-40 … +80 °C (-40 ... +176 °F)
shipment package	-20 … +80 °C (-4 ... +176 °F)
Mechanical connection	ISO G1/2", NPT 1/2", UNF 3/4"-16
Recommended calibration interval	2 years
Weight (ISO1/2")	190 g (6.70 oz)
Complies with EMC standard EN61326-1, Electrical equipment for measurement, control and laboratory use - EMC requirements; Industrial environment	

Accessories

Connection cable for MI70 indicator /DM70 meter	219980
USB connection cable	219690
Sampling cells	DMT242SC, DMT242SC2, DSC74, DSC74B, DSC74C
Flange	DM240FA
Loop-powered external display	226476
ISO 1/2" plug	218773
NPT 1/2" plug	222507

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DPT145 Multiparameter Transmitter for SF6 Gas

The Vaisala Multiparameter Transmitter DPT145 with the DILO DN20 connector.

Features/Benefits

- First transmitter to offer online measurement of seven SF6 parameters in one unit
- Measured parameters: dew point, pressure, temperature
- Calculated parameters: SF6 density, normalized pressure, dew point in atmospheric pressure, ppm
- Saves time and money across the board, from investment and installation to operation and servicing
- More reliable assessment of the condition of SF6 insulation due to online measurement
- Long calibration interval of years
- Digital output RS-485 with MODBUS

The Vaisala Multiparameter Transmitter DPT145 for SF6 Gas is a unique innovation that enables online measurement of dew point, pressure, and temperature. It also calculates four other values, including SF6 density. The DPT145 is especially well suited for integration into OEM systems.

Online Reliability

Online dew point measurement combined with pressure measurement provides an excellent assessment of the condition of the SF6 insulation. Sudden and minor leakages are immediately detected by the direct normalized pressure measurement, while online dew point measurement alerts the user to moisture issues, which can weaken the insulation properties of SF6 and cause rapid deterioration. With the DPT145, it is also easy to build a redundant solution for multiple parameters.

Savings Across the Board

A single transmitter, instead of several, saves time and money across the board, from investment to installation, operation and servicing. Lower assembly costs, fewer cables and connectors, minimized need for on-site visits and field operations - all these translate into cumulative savings. The long calibration interval results in further savings.

Risk-Free, Greener Solution

Online measurement enables gas trends to be followed via a data collection system, making monitoring fast, risk-free, and accurate. Using one instrument for monitoring seven different parameters means also fewer mechanical connections and reduces the risk of leaks. Monitoring is environmentally friendly because there is no need for sampling - no SF6 gas is released into the atmosphere.

The Fruit of Experience

Vaisala has over 70 years of extensive measurement experience and knowledge. The DPT145 brings together the proven DRYCAP® dew point sensor technology and BAROCAP® pressure sensor technology in one package, providing an innovative and convenient solution for monitoring SF6 gas.

The DPT145 with the weather shield.

Technical Data

Measured Parameters

Dewpoint	-50 ... +30 °C (-58 ... +86 °F)
Pressure, absolute	1 ... 12 bar (14.5 ... 174 psi)
Temperature	-40 ... +80 °C (-40 ... +176 °F)

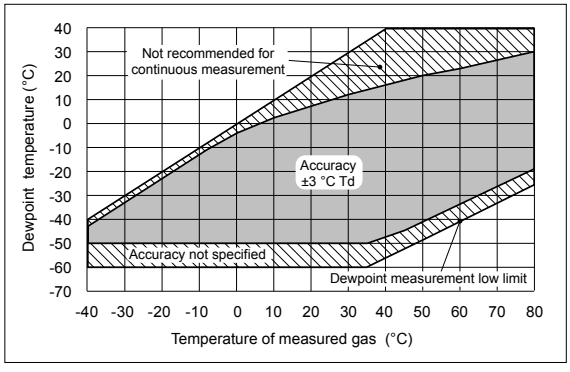
Calculated Parameters

Pressure, normalized to 20 °C (68 °F)	1 ... 12 bar (14.5…174 psi)
SF6 or SF6/N2 mixture density	0 ... 100 kg/m³
ppm moisture, by volume	40 ... 40 000 ppm
Dewpoint, converted to atmospheric pressure	-65 … +30 °C (-85 ... +86 °F)

Performance

Dewpoint accuracy	±3 °C (±5.4 °F), see graph below
Dewpoint stability	typical drift < 2 °C (3.6 °F) /5 years
Pressure accuracy at 23 °C (73.4 °F)	±0.4 %FS
Pressure temperature dependence	±0.01 bar/10 °C (18 °F)
Pressure stability	typical drift < 1 %FS /5 years
Temperature accuracy	
0 ... 40 °C (+32 ... +104 °F)	±0.5 °C (± 0.9 °F)
-40...80 °C (-40 ... +176 °F)	±1 °C (± 1.8 °F)
Density accuracy (pure SF6, 1 ... 12 bara)	
0 ... 40 °C (+32 ... +104 °F)	±1 %FS
-40 ... +60 °C (-40 ... +140 °F)	±2.2 %FS
PPM accuracy, typical (5...1000 ppm, 7 bar)	±(7 ppm + 15% of reading)
Sensor response time:	
Pressure response time	< 1 s
Dewpoint response time* 63% [90%] at 20°C and 1 bar	
-50 -> -10 °C Tdf	5 s [10 s]
-10 -> -50 °C Tdf	10 s [2.5 min]

* system equilibrium related response time is typically longer



DPT145 Dewpoint Measurement Accuracy

Operating Environment

Operating temperature of electronics	-40 … +60 °C (-40 ... +140 °F)
Operating Pressure	0 … 50 bar (0…725 psi)
Relative humidity	0...100 %
Measured gases	SF_6, SF_6/N_2 mixture

Outputs

Digital output	RS-485, non-isolated, Vaisala protocol, MODBUS RTU protocol
Connector	4-pin M8

General

Sensor	Vaisala MPS1 multiparameter sensor
Operating voltage	15 ... 28 VDC
	20 ... 28 VDC in cold temperatures (-40 ... -20 °C (-40 ... -4 °F))
Supply current, during normal measurement	20 mA
during self-diagnostics	max. 300 mA pulsed
Housing material	AISI316L
Housing classification	IP65 (NEMA4)
	Weather shield to be used for continuous outdoor installations
Storage temperature range	
transmitter only	-40 … +80 °C (-40 ... +176 °F)
shipment package	-20 … +80 °C (-4 ... +176 °F)
Mechanical connection	DILO DN20, DILO DN8, ABB Malmkvist, or Alstom G1/2" compatible connector
	Every connection is helium leak tested at the factory.
Dimensional drawings	See the document B211165EN-B
Weight (with DILO adapter)	765 g (27.0 oz)
Complies with EMC standard EN61326-1, Electrical equipment for measurement, control and laboratory use - EMC requirements;	
Industrial environment, Tested levels	
EN/IEC 61000-4-2, Electrostatic Discharge	8kV con / 15kV air
EN/IEC 61000-4-3, RF field immunity	10V/m (80MHz-4.2GHz)
EN/IEC 61000-4-4, Electric Fast Transient	±2kV power and signal
EN/IEC 61000-4-5, Surge	±2kV power line to ground / ±1kV signal line to ground and power line to line
EN/IEC 61000-4-6, Conducted RF Immunity	10Vemf power line and digital output
Mechanical vibration	
EN/IEC 60068-2-6, Fc Sinusoidal vibration	± 6 g, 5-500 Hz sweep 60 min/axis, 3-axis

Accessories

Connection cable for the MI70/DM70 hand-held	219980
USB connection cable	219690
Protection plug for connector	218675SP
1.5 m Shielded PUR cable with 90° connector	231519SP
3m Shielded PUR cable with 90° connector	231520SP
5 m Shielded PUR cable with 90° connector	231521SP
10 m Shielded PUR cable with 90° connector	231522SP
3.0m Shielded FEP cable with straight connector	226902SP
Weather shield	ASM210326SP

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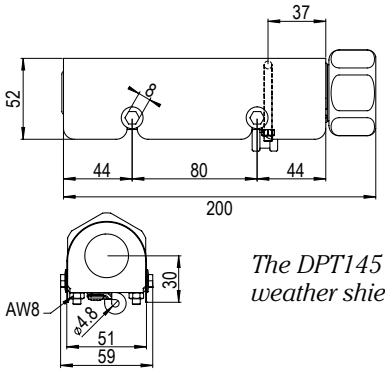
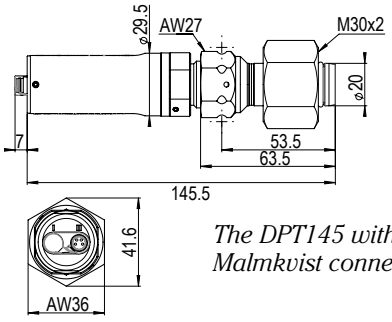
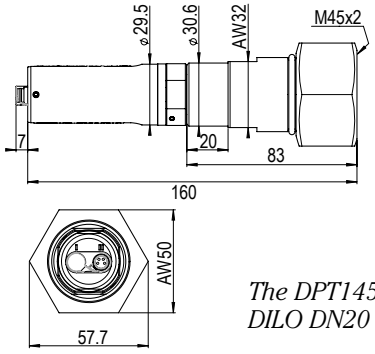
Dimensional Drawings of the DPT145 Multiparameter Transmitter



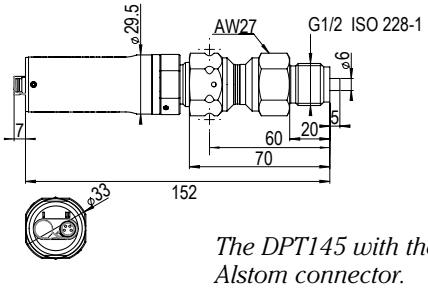
The DPT145 with the weather shield.



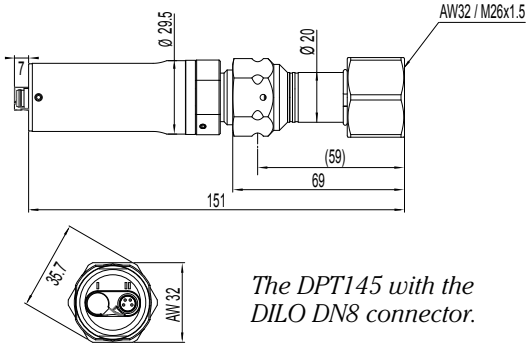
The DPT145 with the ABB Malmkvist connector.



The DPT145 with the DILO DN20 connector.



The DPT145 with the Alstom connector.



The DPT145 with the DILO DN8 connector.

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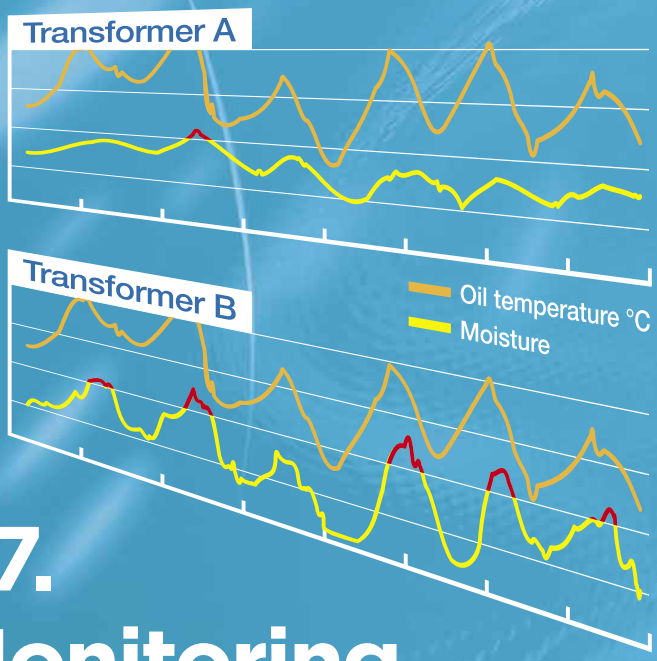


Outages Happen 24/7. So Should Monitoring.

Vaisala Online Measurements for Transformers and Switchgear

Dew Point / Moisture-in-oil / SF6 Density / Pressure

- See moisture fluctuations in varying temperature and load conditions
- Receive early warnings of sudden changes in moisture, pressure and density
- Avoid sampling and waiting for lab results – Act on real time trend data
- Integrate into condition monitoring and data acquisition systems

Real risks, real savings and real performance require – quite simply – real-time monitoring. Let's talk more.

sales@vaisala.com
www.vaisala.com/power

VAISALA

VAISALA / TECHNOLOGY DESCRIPTION

Vaisala HUMICAP® Sensor for Measuring Moisture in Oil

Water is a common contaminant in industrial oils. Water contamination deteriorates the performance of the oil, be it used for lubrication, cooling, insulation or other purposes. High moisture content increases the risk of corrosion, overheating, machine malfunction and other problems and can ultimately lead to costly failure and unscheduled downtime. Monitoring the oil for moisture is a simple way of improving the reliability of industrial machinery and equipment. With time, substantial savings in maintenance costs can be achieved.

Free Water Formation – the Critical Point

Water can dissolve in oil. When the water content of the oil increases, it eventually reaches the saturation point of the oil. Once the fluid has reached its saturation point, any additional water introduced will separate out as free water by forming a distinct layer. Alternatively, the oil can form dispersion with water, which turns the oil cloudy. Since most oils are less dense than water, the water layer will usually settle below the oil with time.

Free water formation is critical in terms of problems related to water in oil. When water is no longer dissolved in the oil, corrosion and wearing of equipment increase rapidly. Therefore it is important to keep the moisture content safely below the saturation point.

The ability of oil to hold dissolved water depends on the type and age of the oil as well as its additives. Two major factors have an effect on the saturation point as the oil ages: temperature fluctuations and changes in the chemical make-up due to the formation of new substances as by-products of the chemical reactions.

Water Activity (a_w) – a Direct Measure of Oil Quality

The conventional measure for water content in oil is ppm (parts per million), which describes the absolute amount of water in the oil. Ppm measurement has, however, a major limitation. It does not account for any variations in the oil's saturation point. In other words, ppm measurement provides no indication of how close the moisture level is to the saturation point in a dynamic system with fluctuating saturation point. By measuring water activity instead of ppm, the risk of actually exceeding the saturation point can be avoided.

Unique Benefits of HUMICAP in Oil Moisture Measurements

- Fast. Online, real-time detection of moisture in oil without sampling
- Reliable. Tells the true margin to water saturation point in all changing conditions, taking into account e.g. temperature changes and aging of oil
- Highly stable. Excellent pressure and temperature tolerance
- Easy to install through ball valve – no need to shut down the process
- Enables predictive maintenance work. Trends can be quickly identified.

Water activity measurement indicates directly whether there is a risk of free water formation. With a relative scale from 0 (no water present) to 1 (the oil is saturated with water) it gives a reliable indication of how close the saturation point of water is.

In contrast to traditional measurement techniques, water activity measurement is independent of oil type. Regardless of the saturation point of the fluid, water activity measurement always provides a true indication for the risk of free water formation, even when the saturation point is increasing or decreasing. In its simplicity, water activity value is understandable at a glance. Trends can be quickly identified.

Vaisala HUMICAP® for Measuring Water Activity

The Vaisala transmitters used for measuring moisture in oil feature the HUMICAP® sensor, a capacitive thin-film polymer sensor especially developed for demanding moisture measurements in liquid hydrocarbons.

The HUMICAP sensor consists of four functional layers: glass substrate, lower electrode, water-active polymer layer, and porous upper electrode. The thin-film polymer either absorbs or releases water as the surrounding moisture level changes. Water molecules move to/from the polymer layer until there is moisture equilibrium between the polymer and the oil. The dielectric properties of the polymer depend on the moisture level. As the moisture level changes, the dielectric properties of the polymer film change, and so does the capacitance of the sensor. The instrument's electronics measure the capacitance of the sensor and convert it into water activity.

Oil molecules or additives do not penetrate the electrode. Thus the sensor output is independent of the oil type.

On-line Measurement

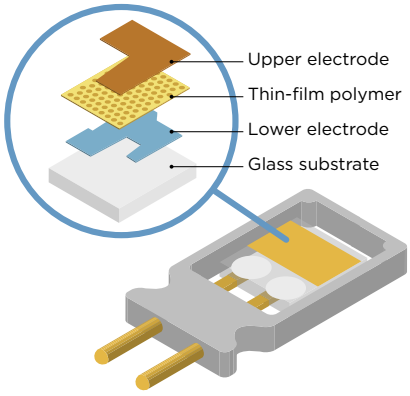
On-line water activity measurement ensures reliable performance of equipment at all times. Time-consuming sampling and laboratory analysis are no longer needed. This not only reduces the risk of human induced error but also provides cost savings in equipment and chemicals.

Typical Applications for Moisture in Oil Measurement

Moisture is an important factor determining the condition of both lubricating and transformer oils. With on-line information on the quality of the oil, preventive actions can be taken and the maintenance costs cut substantially.

HUMICAP in Brief

- A capacitive thin-film polymer sensor
- Water activity (a_w) measurement within range 0...1
- Accurate to +/- 0.02 (a_w)
- 15 years of experience in measuring moisture in oil



Structure of the HUMICAP sensor.

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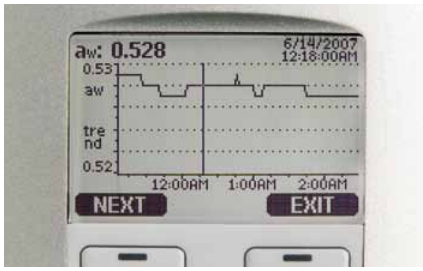
MMT330 Moisture and Temperature Transmitter Series for Oil

The MMT330 transmitter family offers reliable performance for the demanding measurement of moisture in oil.



The display shows measurement trends, real-time data, and measurement history.

Features/Benefits

- Continuous online measurement of moisture in oil
- Ball-valve installation – no need to shut down the process or drain the oil
- Proven Vaisala HUMICAP® sensor, used for over 15 years in oil applications
- Easy field calibration and maintenance – compatible with Vaisala HUMICAP® Hand-Held Moisture Meter for Oil MM70
- NIST traceable calibration (certificate included)
- Analog outputs, RS232/485, WLAN/LAN
- MODBUS protocol support (RTU/TCP)
- Approved for installation in MAN Diesel & Turbo Two-Stroke Diesel Engines lubrication systems

The Vaisala HUMICAP® Moisture and Temperature Transmitter Series for Oil MMT330 enables the fast and reliable detection of moisture in oil. MMT330 series transmitters can be used in online moisture monitoring and as control devices, allowing separators and oil driers to be started only when needed.

Proper monitoring saves both oil and the environment. With the MMT330 series it is easy and economical to monitor the changes of moisture in oil.

Reliable Vaisala HUMICAP® Technology

The MMT330 series incorporates the latest-generation Vaisala HUMICAP® sensor, which is the result of over 15 years of field experience. It was developed for demanding moisture measurement in liquid hydrocarbons.

The sensor's excellent chemical tolerance provides accurate and reliable measurement over a wide measurement range.

For Diverse Applications and Demanding Conditions

With a wide variety of probes, the transmitter can be used in lubrication systems, hydraulic systems, and transformers.

Indicates the Margin to Water Saturation

The MMT330 measures moisture in oil in terms of the water activity (aw) and temperature (T). Water activity indicates directly whether there is a risk of free-water formation. The measurement is independent of oil type and age.

Water Content as ppm Conversion

In addition to water activity, the MMT330 can output ppm, the average mass concentration of water in oil. Vaisala has this conversion readily available for mineral transformer oil.

For other oils, the oil-specific conversion coefficients can be programmed into the transmitter if the water solubility of the oil is known.

Graphical Display of Measurement Data and Trends for Convenient Operation

The MMT330 features a large numerical and graphical display with a multilingual menu and keypad. It allows users to easily monitor operational data, measurement trends, and access measurement history for the past 12 months.

The optional data logger, with real-time clock, makes it possible to generate over four years of measurement history and zoom in on any desired time or time frame.

The display alarm allows any measured parameter to be tracked, with freely configurable low and high limits.

Versatile Outputs and Data Collection

The MMT330 can support up to three analog outputs; an isolated galvanic power supply and relay outputs are also available.

For serial interface the USB connection, RS232, and RS485 can be used.

MMT330 is also capable of applying the MODBUS communication protocol and, together with an appropriate connection option, provides either MODBUS RTU (RS485) or MODBUS TCP/IP (Ethernet) communication.

The data logger, with real-time clock and battery backup, guarantees reliable logging of measurement data for over four years. The recorded data can be viewed on the local display or transferred to a PC with Microsoft Windows® software. The transmitter can also be connected to a network with an optional (W)LAN interface, which enables a (wireless) Ethernet connection. A USB service cable makes it easy to connect the MMT330 to a PC via the service port.

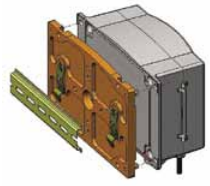
The Vaisala HUMICAP® Hand-Held Moisture for Oil Meter MM70 is designed for field-checking MMT330 transmitters.

Easy Installation

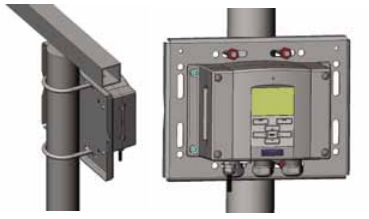
MMT330 transmitters have several options for transmitter mounting. They are delivered installation-ready, pre-configured with all settings.

Mounting Options

Mounting with Wall Mounting Kit



Mounting with DIN Rail Installation Kit



Pole Installation with Installation Kit for Pole or Pipeline

Mounting Rain Shield with Installation Kit

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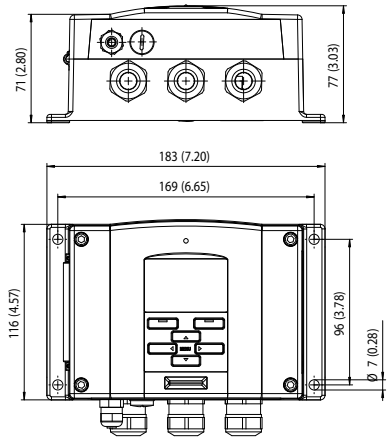
Dimensions

Dimensions in mm (inches)



TYPE APPROVED PRODUCT
CERTIFICATE NO.: A-13529

The MMT332 probe is installed using a flange. It is designed for high-pressure applications.

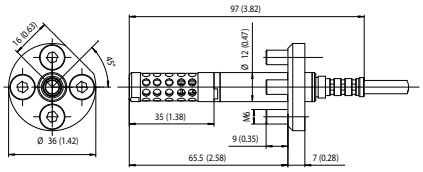
Installation Options

MMT332 for High Pressure Installations

Pressure range	0 ... 250 bar / 0 ... 3625 psia
Probe diameter	12 mm / 0.5"
Installation	
Flange	36 mm / 1.4"
Temperature	
Measurement range	-40 ... +180 °C (-40 ... 356 °F)

Dimensions

Dimensions in mm (inches)



The MMT337 probe, with optional Swagelok® connector, is ideal for tight spaces with a thread connection. The small probe is designed for integration into small diameter lines.

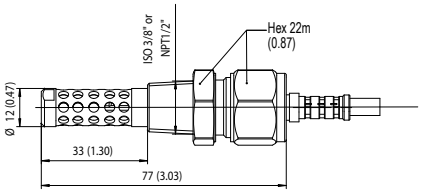
Installation Options

MMT337 with Small-Sized Probe

Pressure range	0 ... 10 bar / 0 ... 145 psia
Probe diameter	12 mm / 0.5"
Installation	
Fitting body	R 3/8" ISO
Fitting body	1/2" ISO
Fitting body	NPT 1/2"
Temperature	
Measurement range	-40 ... +180 °C (-40 ... 356 °F)

Dimensions

Dimensions in mm (inches)



The MMT338 is ideal for installation into pressurized processes where the probe needs to be able to be removed while the process is running. The probe depth is adjustable.

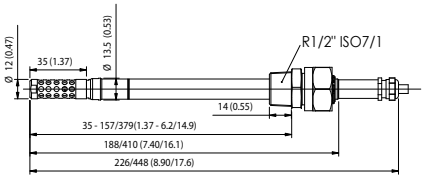
Installation Options

MMT338 with Probe for Pipeline Installations

Pressure range with ball-valve	
	0 ... 40 bar / 0 ... 580 psia
	up to 120 °C (248 °F) and 40 bar
Adjustable length	35 ... 157/379 mm / 1.37 ... 6.2 /14.9"
Installation	
Fitting body	R1/2" ISO
Fitting body	NPT 1/2"
Ball-valve set	BALLVALVE-1
Sampling cell	DMT242SC2
Temperature	
Measurement range	-40 ... +180 °C (-40 ... 356 °F)

Dimensions

Dimensions in mm (inches)



Technical Data

Measured Values

WATER ACTIVITY	
Measurement range a_w	0 ... 1
Accuracy (including non-linearity, hysteresis and repeatability)	
0 ... 0.9	±0.02
0.9 ... 1.0	±0.03
Response time (90%) at +20 °C in still oil (with stainless steel filter)	10 min.
Sensor	HUMICAP® 180_L2

Performance

TEMPERATURE	
Measurement range	
MMT332	-40 ... +180 °C (-40 ... +356 °F)
MMT337	-40 ... +180 °C (-40 ... +356 °F)
MMT338	-40 ... +180 °C (-40 ... +356 °F)
Accuracy at +20 °C (+68 °F)	± 0.2 °C (0.36 °F)

Operating Environment

Operating temperature	
for probes	same as measurement ranges
for transmitter body	-40 ... +60 °C (-40 ... +140 °F)
with display	0 ... +60 °C (+32 ... +140 °F)
Pressure range for probes	see probe specifications
Electromagnetic compatibility	Complies with EMC standard EN61326-1, Industrial environment
	Note: Transmitter with display test impedance of 40 ohm is used in IEC61000-4-5 (Surge immunity)

Inputs and Outputs

Operating voltage	10 ... 35 VDC, 24 VAC ± 20%
with optional power supply module	100 ... 240 VAC 50/60 Hz
Power consumption @ 20 °C (U_{in} 24VDC)	
RS232	max. 25 mA
U_{out} 2 x 0...1V / 0...5V / 0...10V	max. 25 mA
I_{out} 2 x 0...20 mA	max. 60 mA
display and backlight	+ 20 mA
Analog outputs (2 standard, 3rd optional)	
current output	0 ... 20 mA, 4 ... 20 mA
voltage output	0 ... 1 V, 0 ... 5 V, 0 ... 10 V
Accuracy of analog outputs at 20 °C	± 0.05% full scale
Temperature dependence of the analog outputs	± 0.005%/°C full scale
External loads	
current outputs	R_L < 500 ohm
0 ... 1V output	R_L > 2 kohm
0 ... 5V and 0 ... 10V outputs	R_L > 10 kohm
Max. wire size	0.5 mm² (AWG 20) stranded wires recommended
Digital outputs	RS232, RS485 (optional)
Protocols	ASCII commands, MODBUS RTU
Service connection	RS232, USB
Relay outputs	0.5 A, 250 VAC, SPDT, potential-free (optional)
Ethernet interface (optional)	
Supported standards	10BASE-T, 100BASE-TX
Connector	8P8C (RJ45)
IPv4 address assignment	DHCP (automatic), static
Protocols	Telnet, MODBUS TCP/IP
WLAN interface (optional)	
Supported standards	802.11b
Antenna connector type	RP-SMA
IPv4 address assignment	DHCP (automatic), static
Protocols	Telnet, MODBUS TCP/IP
Security	WEP 64/128, WPA
Authentication / Encryption	
Open / no encryption	
Open / WEP	
WPA Pre-shared key / TKIP	
WPA Pre-shared key / CCMP (a.k.a. WPA2)	
Optional data logger with real-time clock	
Logged parameters	max. four with trend/min/max values
Logging interval	10 sec. (fixed)
Max. logging period	4 years, 5 months
Logged points	13.7 million points per parameter
Battery lifetime	min. 5 years
Display	LCD with backlight, graphical trend display of any parameter
Menu languages	English, Chinese, Finnish, French, German, Japanese, Russian, Spanish, Swedish

Mechanics

Cable bushing	M20x1.5 for cable diameter 8 ... 11mm/0.31 ... 0.43"
Conduit fitting	1/2" NPT
Interface cable connector (optional)	M12 series 8-pin (male)
option 1	female plug with 5 m (16.4 ft.) black cable
option 2	female plug with screw terminals
USB-RJ45 Serial Connection Cable (incl. Mi70 Link software)	219685
Probe cable diameter	5.5 mm
Standard probe cable lengths	2 m, 5 m or 10 m (Additional cable lengths available, please see order forms for details)
Housing material	G-AlSi 10 Mg (DIN 1725)
Housing classification	IP 66 IP65 (NEMA4X) with local display
Weight	
depending on selected probe, cable and modules	1.0 - 3.0 kgs
Sensor protection	Stainless steel grid standard filter/ Stainless steel grid filter for high flow rates (>1 m/s)

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MMT310 Series Moisture and Temperature Transmitter for Oil

Two probe options: MMT317 and MMT318

Features/Benefits

- Continuous measurement of moisture in oil
- Proven Vaisala HUMICAP® Sensor, 15 years in oil applications
- Measurements in lubrication, hydraulic and transformer oils
- Excellent pressure and temperature tolerance
- Measuring water activity - ppm calculation for transformer oil
- Small size, easy to integrate
- NIST traceable calibration
- Applications: e.g. monitoring of transformer oil and of lubrication systems in marine and paper industry

The Vaisala HUMICAP® Moisture and Temperature Transmitter Series for Oil MMT310 is a fast and reliable on-line detector for moisture in oil.

Reliable Vaisala HUMICAP® Technology

The MMT310 series incorporates the latest generation of the Vaisala HUMICAP® Sensor, developed for demanding moisture measurement in liquid hydrocarbons. The sensor's excellent chemical tolerance provides accurate and reliable measurement over the wide measurement range.

Measuring Water Activity

The MMT310 series measures moisture in oil in terms of the water activity (aw) and temperature (T).

Water activity directly indicates if there is a risk of free water formation. The measurement is independent of oil type, age, and temperature.

Water Content as PPM Calculation for Transformer Oils

PPM units are traditionally used in transformer applications. They indicate the average mass concentration of water in oil. The ppm calculation for mineral oil based transformer oil is optional in the MMT310 series.

Diverse Applications and Demanding Conditions

The MMT310 series can be used in lubrication and hydraulic systems as well as in transformers. It can be used for on-line moisture monitoring and as a control function, allowing separators and oil purifiers to be started only when necessary.

Installation Options

The MMT318 has two adjustable probe lengths. The transmitter can be ordered with a ball valve set that enables the insertion and removal of the moisture probe for calibration, without the need to empty the oil system.

The MMT317 has a small pressure-tight probe with optional Swagelok fittings.

Several Outputs, One Connector

The MMT310 series has two analog outputs and an RS-232 serial output. The output signals and the supply power travel in the same cable, the only cable connected to the unit.

Technical Data

Measured Values

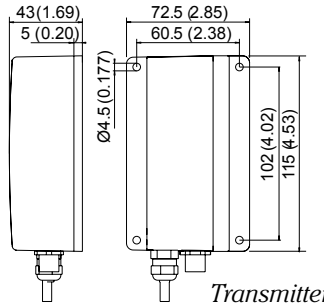
WATER ACTIVITY	
Measurement range a_w	0 ... 1
Accuracy (including non-linearity, hysteresis and repeatability)	
0 ... 0.9	±0.02
0.9 ... 1.0	±0.03
Response time (90 %) at +20 ˚C in still oil (with stainless steel filter)	10 min
Sensor	Vaisala HUMICAP®
TEMPERATURE	
Measurement range	-40 ... +180 ˚C (-40 ... +356 ˚F)
Typical accuracy at +20 ˚C	±0.1 ˚C (±0.18 ˚F)
Typical temperature dependence of electronics	±0.05˚C/ ˚C (±0.005 ˚F/˚F)
Sensor	Pt100 RTD Class F0.1 IEC 60751

Electrical Connections

Two analog outputs, selectable and scalable	0 ... 20 mA or 4 ... 20 mA
Typical accuracy of analog output at +20 ˚C	±0.05 % full scale
Typical temperature dependence of analog output	0.005 %/˚C (0.003 %/˚F) full scale
Serial output	RS-232C
Connections	8-pole connector with RS-232C, current outputs (two channels) and U_{in}
Operating voltage U_{in}	24 VDC (10 ... 35 VDC)
Minimum operating voltage U_{in}	
with RS-232C	10 VDC
I_{out} 0 ... 20 mA, 4 ... 20 mA	11 VDC + (R_{load}/60) VDC
Power consumption at +20 ˚C, U_{in} = 24 VDC	
with RS-232C	20 mA
I_{out} 2 x 0 ... 20 mA	60 mA

Dimensions

Dimensions in mm (inches)



Transmitter body

General

Operating temperature range for electronics	-40 ... +60 ˚C (-40 ... +140 ˚F)
Storage temperature	-55 ... +80 ˚C (-67 ... +176 ˚F)
Pressure range for MMT318 with ball valve up to 120 ˚C	0 ... 40 bar
Pressure range for MMT317	0 ... 10 bar
External load	R_l<500 Ohm
Material	
transmitter housing	G-AlSi 10 Mg
transmitter base	ABS/PC
Housing classification	IP65 to be protected from direct rain
Cable feed through alternatives	8-pole connector with 5 m cable, female 8-pin connector screw joint for cable diameter 4 ... 8 mm
Sensor protection	stainless steel grid standard filter stainless steel grid filter for high flow rates (>1 m/s)
Probe cable length	
MMT317	0.5, 2, 5 or 10 meters
MMT318	2, 5 or 10 meters
Probe installation MMT317	
Swagelok®	NPT 1/2", ISO 3/8" or ISO 1/2"
Probe installation MMT318	
Fitting bodies	ISO 1/2", NPT 1/2"
Ball Valve Set	BALLVALVE-1
Complies with EMC standard EN61326-1, Industrial environment	

Note: When using the current output, the RF field susceptibility level according to standard EN61000-4-3 with a frequency band of 110 ... 165 MHz, is only 3 V/m (generic environment) with the specified accuracy.

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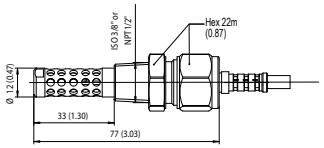
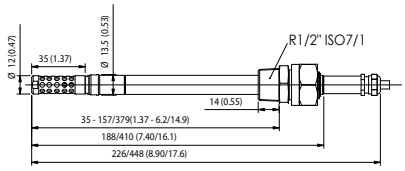


MMT317 probe



MMT318 probe

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MMT162 Compact Moisture in Oil and Temperature Transmitter for OEM Applications

The MMT162 enables on-line moisture monitoring in oils even in the most demanding applications.

Features/Benefits

- Continuous measurement of moisture in oil
- Measures in lubrication, hydraulic and transformer oils
- Excellent pressure and temperature tolerance
- Proven Vaisala HUMICAP® Sensor, 15 years in oil applications
- Measures water activity - ppm-calculation available for transformer oil
- Small size, easy to integrate
- NIST traceable calibration (certificate included)

The Vaisala HUMICAP® Moisture and Temperature Transmitter for Oil MMT162 is an excellent economical solution for reliable on-line detection of moisture in oil.

Reliable Vaisala HUMICAP® Technology

The MMT162 incorporates the latest generation of the Vaisala HUMICAP® Sensor. The sensor is developed for demanding moisture measurement in liquid hydrocarbons and has been successfully used in oil applications for over a decade. The sensor's excellent chemical tolerance provides accurate and reliable measurement over the measurement range.

Water Activity Measurement

The MMT162 measures moisture in oil in terms of the water activity (aw) and temperature (T). Water activity directly indicates whether there is a risk of free water formation. The measurement is independent of oil type, age and temperature. The ppm calculation for mineral oil based transformer oil is optional in the MMT162.

Several Outputs - One Connector

The MMT162 has two analog outputs that can be scaled and the measurement ranges changed. Additionally, the transmitter has an RS-485 serial output. The signals and the unit power travel in the same cable.

An optional LED-cable enables a visual alarm.

Compact, Rugged and Intelligent

Due to its compact size, the MMT162 is quickly and easily installed in tight spaces. Units are delivered fully assembled, however, you can re-configure them to suit your needs.

MM70

In combination with an MM70 indicator, the MMT162 provides an ideal tool for on site calibration. The MI70 indicator can be used as a display, communication, and data-logging device for the MMT162.

Technical Data

Measured Values

WATER ACTIVITY	
Measurement range	0 ... 1 aw
Accuracy (including non-linearity, hysteresis and repeatability)	
0 ... 0.9	± 0.02
0.9 ... 1.0	± 0.03
Response time	
in oil flow (typical)	<1 min (dry-wet)
MOISTURE	
Calculated moisture content in ppm for mineral transformer oil	
TEMPERATURE	
Accuracy at +20 °C (+68 °F)	± 0.2 °C (0.36 °F)

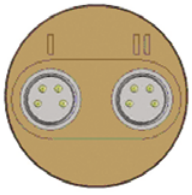
Operating Environment

Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
Oil temperature	-40 ... +80 °C (-40 ... +176 °F)
Pressure range	
metal version	up to 200 bar
plastic version	up to 40 bar
Oil flow	some flow recommended

Outputs

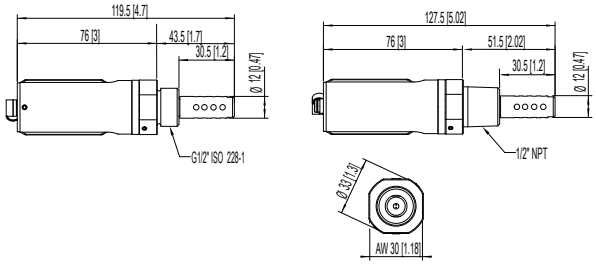
Analog outputs (two channels)	
current output	0 ... 20 mA, 4 ... 20 mA
voltage output	0 ... 5 V, 0 ... 10 V
Alarm level indication by analog signal	user selectable
Digital outputs	RS-485

Pin	I	II
1	Vsupply	Vsupply
2	Ch 1	RS-485 - / B
3	GND	GND
4	Ch 2	RS-485 + / A



Dimensions

Dimensions in mm (inches)



General

Sensor	HUMICAP®
Cable connections (2 ports)	M8, 4 pin
Minimum operating voltage with	
RS-485 output	14 ... 28 VDC
voltage output	16 ... 28 VDC
current output	22 ... 28 VDC
Supply current	
normal measurement	20 mA + load current
External load for	
voltage output	min. 10 kOhm
current output	max. 500 Ohm
Housing material	
metal	AISI 316L
plastic	PPS + 40% GF
Mechanical connections with bonded seal ring (washer)	
metal version	G 1/2" ISO or NPT 1/2''
plastic version	G 1/2'' ISO
Housing classification	IP65 (NEMA 4)
Storage temperature range	-40 ... +80 °C (-40 ... +176 °F)
Weight	
with plastic housing	65 g (2.3 oz)
with metal housing	200 g (7 oz)
Complies with EMC standard EN61326-1, Electrical equipment for measurement control and laboratory use - EMC requirements; Industrial environment	

Options and Accessories

Stainless steel filter (standard)	225356SP
Stainless steel filter for high flow (>1 m/s)	221494SP
Connection cable for MM70 hand-held meter	219980
USB serial interface cable	219690
Sealing ring set (U-seal) ISO G1/2, 3 pcs	221525SP
Sealing ring set (copper) ISO G1/2, 3 pcs	221524SP
ISO 1/2" plug	218773
NPT 1/2" plug	222507
Sampling cell	DMT242SC
Sampling cell w. Swagelok connectors	DMT242SC2
Connection cable	
2 m (6.5 ft), M8 snap-on	211598
0.32 m (1 ft) Shielded, M8 threaded	HMP50Z032
3.0 m (9.8 ft), Shielded, M8 threaded	HMP50Z300SP
5.0 m (16.4 ft), Shielded, M8 threaded	HMP50Z500SP
10 m (32.8 ft), Shielded, M8 threaded	HMP50Z1000SP
3 m, connector 90° angle	221739
5 m, connector 90° angle	221740
M8 threaded, Ch1 signal + Ch2 LED	MP300LEDCBL

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MM70 Hand-Held Moisture and Temperature Meter for Spot-Checking in Oil

The MM70 is an ideal tool for the preventive maintenance of oil-filled systems. The water activity measurement indicates the margin to free water formation, which causes severe problems in lubrication systems.

Features/Benefits

- Measurement independent of oil type, age and temperature
- In-line process checking through ball valve, no need to drain the oil
- Rugged and reliable construction
- Excellent pressure and temperature tolerance
- Data can be logged and transferred to a PC
- Proven Vaisala HUMICAP® Sensor, 15 years in oil applications.
- Compatible with Vaisala's fixed oil moisture instruments
- No reference oil needed for recalibration
- NIST traceable (certificate included)

The Vaisala HUMICAP® Hand-held Moisture Meter for Oil MM70 enables reliable detection of moisture in oil.

In-Line Process Checking Through Ball Valve

The probe can be inserted directly into the process pipe through a ball valve without draining the oil in the system.

Water Activity Measurement

The MM70 measures moisture in oil in terms of the water activity (aw) and temperature (T). Water activity directly indicates whether there is a risk of free water formation. The measurement is independent of oil type, age and temperature.

PPM Calculation Included

The MM70 has an embedded model for expressing moisture as ppm in mineral transformer oil. The customer can enter up to three other oil models into the meter's memory.

Numerical and Graphical Display

The MM70 features a multilingual, menu-based user interface and a backlit LCD display. The measurement parameters can be numerically and graphically displayed and logged into the meter's memory at the same time. An analog output option is also available.

Connection to PC

The optional MI70 Link Windows® software in combination with a USB connection cable is used to transfer logged data and real time measurement data from the MM70 to a PC.

Proven Vaisala HUMICAP® Technology

The MM70 incorporates the latest generation of the Vaisala HUMICAP® Sensor, developed for demanding moisture measurements in liquid hydrocarbons. The sensor's excellent chemical tolerance provides accurate and reliable measurement over the measurement range.

Speedy Service - Once a Year

The meter can be recalibrated by sending the probe to Vaisala Service, or customers can calibrate the instrument themselves using a standard relative humidity calibration.

Multi-Probe Operation

One or two probes can be connected simultaneously. Maintenance teams can use additional Vaisala dew point or relative humidity probes for other tasks. For example, a dew point probe is ideal for checking the moisture inside washed and dried oil tanks.

Technical Data

Performance

WATER ACTIVITY	
Measurement range a_w	0 ... 1
Accuracy (including nonlinearity, hysteresis and repeatability)	
When calibrated against salt solutions (ASTM E104-85):	
0 ... 0.9	±0.02
0.9 ... 1.0	±0.03
Maximum achievable accuracy when calibrated against high-quality, certified humidity standards:	
0 ... 0.9	±0.01
0.9 ... 1.0	±0.02
Response time (90%) at +20 °C (+68 °F)	
in still oil (with stainless steel filter)	10 min.
Sensor	Vaisala HUMICAP® 180_L2
Recommended recalibration interval	1 year
TEMPERATURE	
Measurement range	-40 ... +100 °C (-40 ... +212 °F)
Typical accuracy at +20 °C	±0.2 °C (±0.36 °F)
Typical temperature dependence of electronics	±0.005 °C/°C (±0.005 °F/°F)
Sensor	Pt100 RTD Class F0.1 IEC 60751
Typical long-term stability	better than 0.01 aw / year

Operating Environment

PROBE	
Operating temperature range for electronics	-40 ... +60 °C (-40 ... +140 °F)
Operating pressure range	max. 20 bar
during installation through ball valve	max. 10 bar
Oil flow range	max. 1 m/s
INDICATOR	
Operating temperature range	-10 ... +40 °C (+14 ... +104 °F)
Operating humidity range	non-condensing
ELECTROMAGNETIC COMPATIBILITY	
Complies with EMC standard EN61326-1, Electrical equipment for measurement, control and laboratory use - EMC requirements; Portable equipment.	

Inputs and Outputs

Power supply	Rechargeable NiMH battery pack with AC-adapter or 4xAA-size alkalines, type IEC LR6
Battery operation time	
continuous use	48 h typical at +20 °C (+68 °F)
data logging use	up to a month, depending on logging interval
Menu languages	English, Chinese, Spanish, French, German, Japanese, Russian, Swedish, Finnish
Display	LCD with backlight, graphic trend display of any parameter, character height up to 16 mm
Analog output	0 ... 1 VDC
Output resolution	0.6 mV
PC interface	MI70 Link software with USB or serial port cable
Data logging capacity	2700 points
Alarm	Audible alarm function

Mechanics

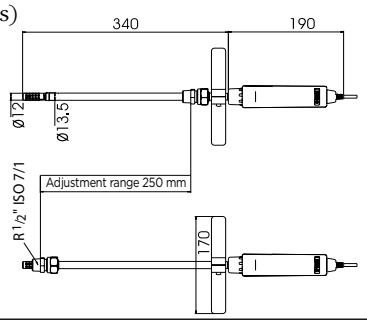
PROBE	
Housing classification	IP65 (NEMA 4)
Housing material	ABS/PC blend
Probe material	Stainless steel (AISI316L)
Cable length between probe and indicator	1.9 m, 10 m extension available
Weight	506 g
INDICATOR	
Housing classification	IP54
Weight	400 g
Probe inputs	1 or 2

Options and Accessories

Carrying case	MI70CASE2
Ball valve set (incl. fitting body & blanking plug)	HMP228BVS
Probe cable extension, 10 m	213107SP
Transmitter connection cables for	
MMT162	219980
MMT310	DRW216050
MMT330	211339
MI70 Link software with USB cable	219687
MI70 Link software with serial port cable	MI70LINK
Analog output cable	27168ZZ
Sensor protection	HM47453SP
Dew point measurement probes	DMP74A/B
Relative humidity measurement probes	HMP75, HMP76, HMP77

Dimensions

Dimensions in mm (inches)



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VAISALA / TECHNOLOGY DESCRIPTION

Vaisala CARBOCAP® Sensor for Measuring Carbon Dioxide

First launched in 1997, the Vaisala CARBOCAP® carbon dioxide (CO_2) sensor features a groundbreaking innovation – the micromachined, electrically tunable Fabry-Perot Interferometer (FPI) filter for built-in reference measurement. This reliable and stable sensor has been delivering accurate CO_2 measurements for over 15 years across a wide range of industries and applications, from building automation and safety to life sciences and ecological research.

How It Works

Carbon dioxide has a characteristic absorbance band in the infrared (IR) region at a wavelength of 4.26 µm. This means that when IR radiation is passed through a gas containing CO_2, part of the radiation is absorbed. Therefore, the amount of radiation passing through the gas depends on the amount of CO_2 present, and this can be detected with an IR detector.

The Vaisala CARBOCAP sensor features an electrically tunable FPI filter located in front of the IR detector. In addition to measuring CO_2 absorption, the micromechanical FPI filter enables a reference measurement at a wavelength where no absorption occurs. When taking the reference measurement, the FPI filter is electrically adjusted to switch the bypass band from the absorption wavelength to a non-absorption wavelength. The reference measurement compensates for any potential changes in the light source intensity, as well as for contamination and dirt accumulation in the optical path. This feature means that CARBOCAP sensor operation is highly stable over time.

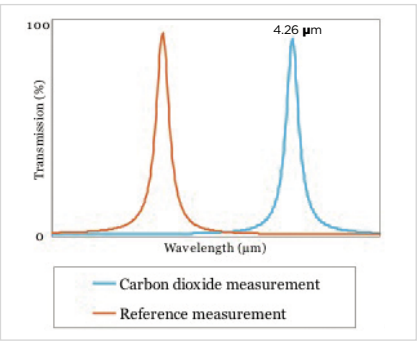
Instruments measuring at both the absorption and the reference wavelength with a single light source are known as single-beam dual-wavelength instruments. The technology is widely applied in costly analyzers. The unique feature of the CARBOCAP sensor is its micromachined FPI filter, which performs a dual-wavelength measurement using a single detector. The compact size of the sensor means that this advanced technology can be incorporated into small probes, modules, and transmitters.

CARBOCAP in Brief

- A silicon-based infrared (IR) absorption sensor
- Continuous internal reference measurement
- Both ppm and percentage-level CO_2 measurement
- Providing accurate measurements for over 15 years

CARBOCAP's Unique Benefits

- Superior stability enabled by built-in reference measurement
- Minimal maintenance and calibration requirements
- Insensitive to dust, water vapor, and most chemicals
- Insensitive to changing air flow



Both absorption and reference are measured with the CARBOCAP sensor.

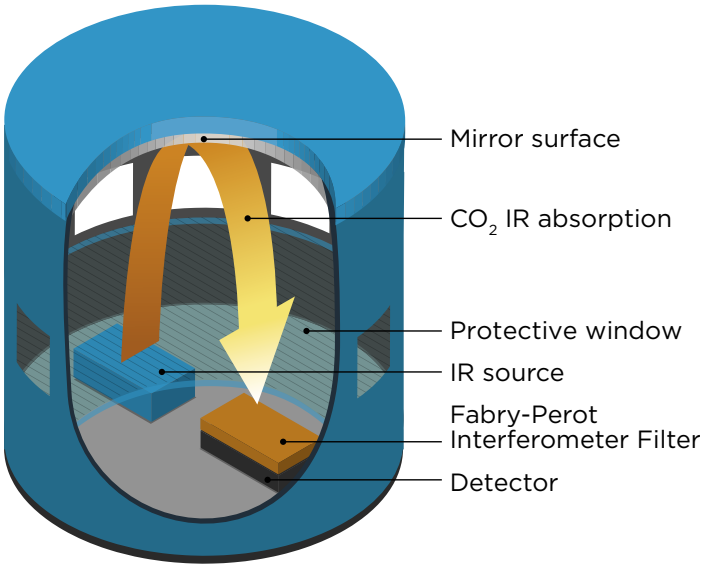
Typical Applications for Carbon Dioxide Measurement

Vaisala CARBOCAP instruments are well suited to a wide range of applications, from ppm (parts per million) to percentage-level CO_2-measurements. Since CO_2 is harmful in high concentrations, it is present at percentage levels only within closed processes such as fermentation and controlled-atmosphere storage environments. Percentage-level measurements are also typical in life-science applications such as CO_2 incubation.

Normal atmospheric air includes CO_2 at ppm levels. Typical CARBOCAP applications include ventilation control in buildings occupied by people, animal shelters, and greenhouses. In areas where large volumes of CO_2 are handled, reliable CO_2 measurement with alarm control is an important safety precaution. The CARBOCAP sensor is also a popular choice in ecological measurement applications, where excellent long-term stability and tolerance to harsh conditions are important requirements.

CARBOCAP CO_2 Products

Vaisala offers instruments for measuring CO_2 at ppm and percentage levels in both indoor and outdoor environments. Vaisala's wide variety of CO_2 instruments ranges from hand-held meters, measurement modules, and industrial transmitters to high-volume, affordable transmitters for volume applications. View the complete range of CO_2 products at www.vaisala.com/carbondioxide.



Structure of the CARBOCAP sensor.

The CARBOCAP® Story

The CARBOCAP story began in 1992, when micromechanical sensors were being intensively researched at Vaisala. The groundbreaking idea of miniaturizing the Fabry-Perot Interferometer (FPI) was born, leading to collaborative development work with VTT Technical Research Center of Finland. Later, a patent application was submitted for a single-channel gas concentration measurement method using the FPI.

The driving force behind the innovation of the CARBOCAP sensor was Vaisala's commitment to developing superior technologies for environmental measurements. And indeed, Vaisala's pioneering work in the field of silicon-based NDIR technology and electrically tunable filters resulted in the compact, simple and high-performance CARBOCAP sensor. To this day, the long-term stability and reliability of the measurement provided by the FPI is unrivaled.

The first commercial CARBOCAP products for measuring ppm-level CO_2 in ventilation applications were launched in 1997, with instruments for percentage-level CO_2 measurements following soon after. CARBOCAP technology is proven in a wide range of applications, including ecological measurements, where it performs reliably in harsh environments such as soil and snow, satisfying the thirst for knowledge that scientists have for understanding nature's processes.

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For more information, visit www.vaisala.com or contact us at sales@vaisala.com

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GMP343 Carbon Dioxide Probe for Demanding Measurements

The GMP343 is available as an open-path diffusion-aspirated model (left) and as a flow-through model (right).

Features/Benefits

- Excellent accuracy and stability
- Vaisala CARBOCAP® Sensor, a silicon-based non-dispersive infrared (NDIR) sensor
- A single-beam, dual-wavelength CO_2 measurement with no moving parts
- Compensation options for temperature, pressure, humidity and oxygen
- Low power consumption and heat emission
- Designed for outdoor use
- Compact and lightweight

The Vaisala CARBOCAP® Carbon Dioxide Probe GMP343 is an accurate and rugged probe-type instrument for ecological measurements. Typical applications include CO_2 soil respiration, ambient CO_2 monitoring, plant growth chambers, and OEM applications.

The GMP343 can output both numerically filtered and raw measurement data and it can also compensate the measurement with an internal temperature measurement and user-set relative humidity, pressure and oxygen values.

In combination with an MI70 indicator, the GMP343 provides a tool for accurate in-situ measurement. The MI70 can be used as a display, communication and data logging device.

Each GMP343 is calibrated using ±0.5 % accurate gases at 0 ppm, 200 ppm, 370 ppm, 600 ppm, 1000 ppm, 4000 ppm and 2 %. Calibration is also done at temperature points of -30 °C, 0 °C, 25 °C and 50 °C. If needed, the customer can recalibrate the instrument using the multipoint calibration (MPC) feature allowing up to 8 user-defined calibration points.

Technical Data

Performance

Measurement range options	0 ... 1000 ppm, 0 ... 2000 ppm, 0 ... 3000 ppm, 0 ... 4000 ppm, 0 ... 5000 ppm, 0 ... 2 %

Accuracy (excluding noise) at 25 °C (77 °F) and 1013 hPa after factory calibration with 0.5 % accurate gases with different range options

0 ... 1000 ppm	±(3 ppm + 1 % of reading)
0 ... 2000 ppm - 0 ... 2 %*	±(5 ppm + 2 % of reading)

*Accuracy below 200 ppm CO_2 not specified for 2 % range option

Noise (repeatability) at 370 ppm CO_2

with no output averaging	±3 ppm CO_2
with 30 s output averaging	±1 ppm CO_2

TEMPERATURE

Effect on accuracy **with** temperature compensation:

CO_2 range options	0 ... 1000 ppm	0 ... 2 000 - 5000 ppm	0 ... 2 %
Temperature °C (°F)	Accuracy (% of reading)*		
+10 ... +40 (+50 ... +104)	±1	±1	±2
+40 ... +60 (+104 ... +140)	±2	±3	±4
-40 ... +10 (-40 ... +50)	±3	±3	±5

* Always at least ±10 ppm CO_2.

Temperature compensation is performed by an integrated Pt1000 element

Technical Data

PRESSURE

Effect on accuracy **with** pressure compensation:

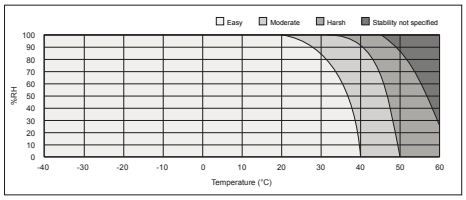
CO_2 range options	0 ... 1000 ppm	0 ... 2000 - 2 %
Pressure (hPa)	Accuracy (% of reading)	
900 ... 1050	±0.5	±1
700 ... 1300	±1	±2

Integrated pressure sensor is **not** included in GMP343

Long term stability	see graph below
easy	±2 % of reading */ year
moderate	±2 % of reading */ 6 months
harsh	±2 % of reading */ 3 months

* Always at least ±10 ppm CO_2.

GMP343 OPERATING CONDITIONS



Response time (90 %)

DIFFUSION MODEL		
Filter attached	Averaging (s)	Response (s)
Yes	0	75
Yes	30	82
No	0	<2
No	30	30

FLOW-THROUGH MODEL		
Gas flow (l/min)	Averaging (s)	Response (s)
0.3	0	26
0.3	30	44
1.2	0	8
1.2	30	23

Warm-up time	
full accuracy ±0.5 %	10 min
full accuracy	30 min

Operating Environment

Temperature	
operating	-40 ... +60 °C (-40 ... +140 °F)
storage	-40 ... +70 °C (-40 ... 158 °F)
Humidity	see graph 'GMP343 Operating Conditions'
Pressure	
compensated range	700 ... 1300 hPa
operating	<5 bar
Gas flow for flow-through model	0 ... 10 liters/min
Electromagnetic compatibility	EN61326, Generic Environment

Inputs and Outputs

Operating voltage	11 ... 36 VDC
Power consumption	
without optics heating	<1 W
with optics heating	<3.5 W
ANALOG OUTPUTS	
Current output	
range	4 ... 20 mA
resolution	14 bits
max. load	800 Ohm @ 24 VDC, 150 Ohm @ 10 VDC
Voltage output	
range	0 ... 2.5 V, 0 ... 5 V
resolution	14 bits (13 bits with 0 ... 2.5 V)
min. load	5 kOhm
DIGITAL OUTPUTS	RS485, RS232

Materials

Housing	anodized aluminium
Filter cover	PC
IP classification	
Housing (cable attached)	IP67
Diffusion filter (weather protection)	IP65
Diffusion filter (sintered PTFE)	IP66
Cable connector type	8-pin M12
Weight (probe only)	360 g

Options and Accessories

Wall mount bracket	GMP343BRACKET
Mounting flange	GMP343FLANGE
Standard diffusion filter (weather protection, IP65) +filter cover	GMP343FILTER
Diffusion filter (sintered PTFE filter, IP66) + filter cover	215521
Calibration adapter (for the diffusion model)	GMP343ADAPTER
Junction box	JUNCTIONBOX-8
Probe cables	
2m	GMP343Z200SP
6m	GMP343Z600SP
10m	GMP343Z1000SP
PC connection cable, 2m	213379
MI70 connection cable, 2m	DRW216050SP
USB adapter (USB-D9 Serial connection cable)	219686
Soil adapter kit for horizontal positioning	215519
Soil adapter kit for vertical positioning	215520

For full specifications, see the GMP343 User's Guide.

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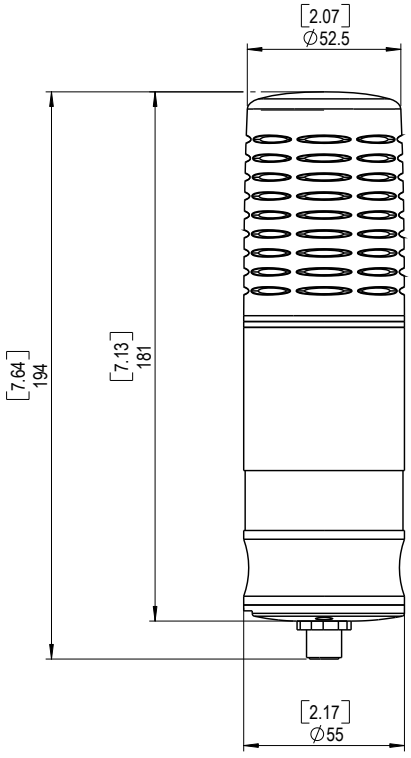
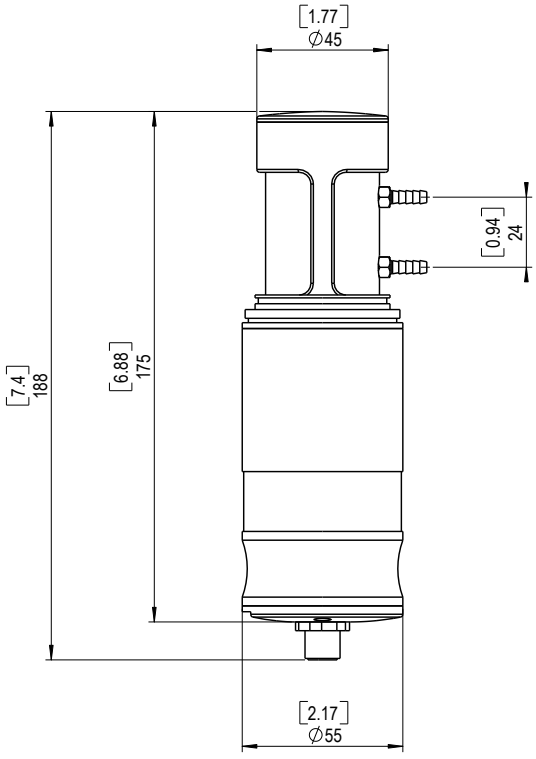
Dimensional Drawings of the GMP343 Carbon Dioxide Probe

Dimensions in mm (inches)



Diffusion model



Flow-through model

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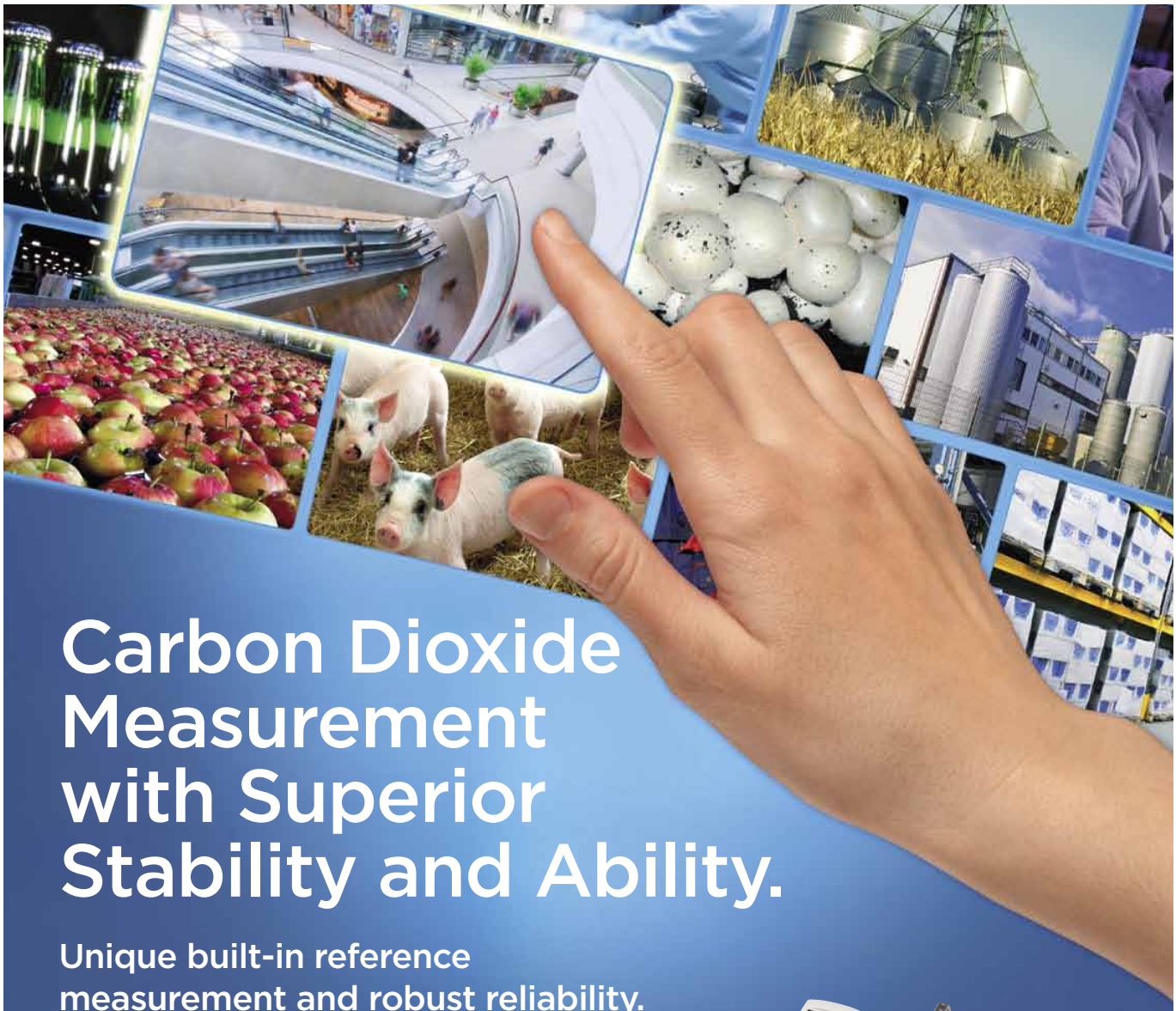


Carbon Dioxide Measurement with Superior Stability and Ability.

Unique built-in reference measurement and robust reliability.

Stability is what everyone promises. But it is exactly what Vaisala CARBOCAP® successfully delivers with its unique built-in reference measurement. Vaisala CARBOCAP® combines the ease and cost efficiency of extra long calibration intervals with leading accuracy on both ppm and percentage level measurements.

While highly sensitive to carbon dioxide, CARBOCAP® is insensitive to water vapor, dust and most chemicals. This has made it the trusted sensor for harsh and humid environments. Proven for over 15 years in hundreds of applications and dozens of industries, worldwide.

Choose from a wide range of fixed and handheld instruments for different applications, requirements and budgets and enjoy superior stability with leading ability.

www.vaisala.com/carbondioxide
sales@vaisala.com

VAISALA

GMT220 Series Carbon Dioxide Transmitters for Industrial Applications

The GMT220 transmitters withstand harsh and humid environments.

Features/Benefits

- Incorporates Vaisala CARBOCAP® - the silicon-based NDIR sensor
- IP65 protected against dust and spray water
- Several measurement ranges
- Easy installation
- Standard analog outputs and two configurable relays available

Applications include:

- Horticulture and fruit storage
- Greenhouses and mushroom farming
- Safety alarming and leakage monitoring
- Demand controlled ventilation in harsh environments

The Vaisala CARBOCAP® Carbon Dioxide Transmitter Series GMT220 is designed to measure carbon dioxide in harsh and humid environments. The housing is dust- and waterproof to IP65 standards.

The GMT220 series transmitters incorporate the advanced Vaisala CARBOCAP® Sensor. The patented sensor has unique reference measurement capabilities. Its critical parts are made of silicon; this gives the sensor outstanding stability over both time and temperature. By lengthening the calibration intervals, the user saves both time and money.

Interchangeable Probes

The user has a choice of measurement ranges up to 20% of CO_2. The GMT221 is for higher concentrations of CO_2 and the GMT222 for lower concentrations of CO_2. The GMT220 probes are interchangeable. They can be removed and reattached or replaced at any time – without the need for calibration and adjustment. The probes can be attached directly to the transmitter body or, when used with a cable, installed remotely into hard-to-reach places or areas with dangerously high levels of CO_2.

The interchangeability of the GMT220 transmitter's probes truly facilitates field maintenance.

The end user can carry out field maintenance without any additional equipment or heavy and expensive calibration gas bottles by simply replacing a probe.

Probes that have been replaced can be sent to Vaisala for recalibration.

Technical Data

Performance

Measurement Ranges	
GMT221	0 ... 2 %
for high concentrations	0 ... 3 %
	0 ... 5 %
	0 ... 10 %
	0 ... 20 %
GMT222	0 ... 2000 ppm
for low concentrations	0 ... 3000 ppm
	0 ... 5000 ppm
	0 ... 7000 ppm
	0 ... 10 000 ppm
Accuracy (including repeatability, non-linearity and calibration uncertainty) at 25 °C and 1013 hPa	
GMT221	±(1.5 % of range + 2 % of reading)
(applies for concentrations above 2 % of full scale)	
GMT222	±(1.5 % of range + 2 % of reading)
Temperature dependence, typical	-0.3 % of reading / °C
Pressure dependence, typical	+0.15 % of reading/hPa
Long-term stability	<±5 %FS/2 years
Response time (63 %)	
GMT221	20 seconds
GMT222	30 seconds
Warm-up time	30 seconds, 15 minutes full specifications

Inputs and Outputs

Outputs	0 ... 20 or 4 ... 20 mA and 0 ... 10 V
Resolution of analog outputs	12 bits
Recommended external load:	
current output	max. 400 Ohm
voltage output	min. 1 kOhm
Two pre-or user-defined relay outputs	
Relay contacts	max. 30VAC/60VDC, 0.5A
Connections	screw terminals, 0.5 ... 1.5 mm^2
Operating voltage	16 ... 35 VDC or 24 VAC (±20%)
Power consumption	<4 W

Operating Environment

Operating temperature	-20 ... +60 °C (-4 ... +140 °F)
with display	0 ... +50 °C (+32 ... +122 °F)
Storage temperature	-30 ... +70 °C (-22 ... +158 °F)
Operating pressure (compensated range)	700 ... 1300 hPa
Humidity	0 ... 100 %RH, non-condensing
Electromagnetic compatibility	EN61326-1, Generic Environment

Mechanics

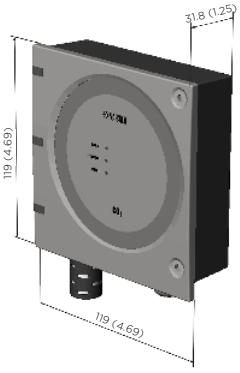
Housing material	
transmitter body	ABS plastic
probe	PC plastic
Housing classification	IP65
Weight:	
GMT221	max. 280 g
GMT222	max. 300 g
Probe cable length	2 m and 10 m (optional)

Accessories

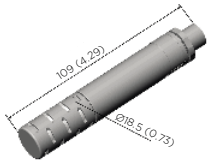
Spare probe	GMP221, GMP222
(use the order form to define measurement range etc.)	
Clips (2 pcs) for attaching the probe	25245GM
Mounting flange for the probe	GM45156SP
Probe cables	
2 m	25665GMSP
10 m	210848GMSP
Calibrator for interchangeable probes	GMK220
Wall Assembly Plate	GM45160
In-soil adapter for probe	211921GM
Serial COM adapter	19040GM
Calibration adapter for probe	26150GM

Dimensions

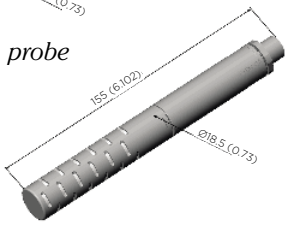
Dimensions in mm (inches)



GMT220 transmitter



GMP221 probe



GMP222 probe

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www.vaisala.com/requestinfo

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CE

Scan the code for more information

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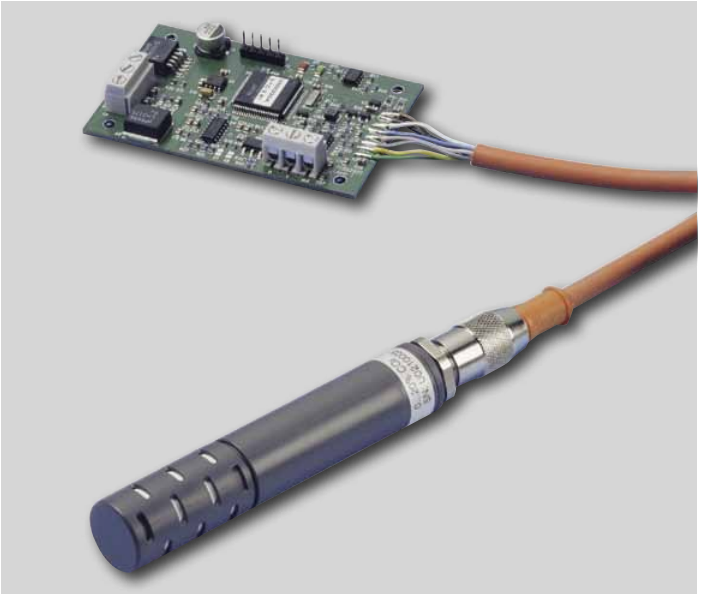
GMM220 Carbon Dioxide Modules for Demanding OEM Applications



The Vaisala CARBOCAP® Carbon Dioxide Module Series GMM220 withstand harsh conditions. They provide high carbon dioxide measurement accuracy over wide temperature and relative humidity ranges.

Features/Benefits

- Incorporates Vaisala CARBOCAP® - the silicon based CO_2 sensor
- Choice of several measurement ranges
- IP65 protected probe against dust and spray water
- Interchangeable probes provide easy maintenance
- Modules optimized for integration into equipment for greenhouse control, incubators, fermentors, safety alarming and integrated systems.

For Harsh Environments

The Vaisala CARBOCAP® Carbon Dioxide Module Series GMM220 are designed for Original Equipment Manufacturers (OEM's) requiring carbon dioxide measurements in harsh and demanding applications.

Vaisala CARBOCAP®

The GMM220 series modules incorporate the industrial Vaisala CARBOCAP® Sensor. The patented sensor has unique reference measurement capabilities. Its critical parts are made of silicon; this gives the sensor outstanding stability over both time and temperature.

Since water vapor, dust, and most chemicals do not affect the measurement, the GMM220 series modules can be used in harsh and humid environments.

Interchangeable Probes

The GMP220 probes are interchangeable. They can be removed, reattached or replaced at any time – without the need for calibration and adjustment. The interchangeable probes make calibration and field service easy. In addition, the measurement range can be changed simply by replacing one probe with another.

Different Configurations

The user has a choice of measurement ranges up to 20 % CO_2: the Vaisala CARBOCAP® Carbon Dioxide Module GMM221 for higher and the Vaisala CARBOCAP® Carbon Dioxide Module GMM222 for lower concentrations of CO_2.

Different power supply voltages, output options, as well as cable lengths, connectors, and mounting gear are also available.

Technical Data

Carbon Dioxide

Measurement ranges	
GMM221 for high concentrations	0 ... 2 %, 0 ... 3 %, 0 ... 5 %, 0 ... 10 %, 0 ... 20 %
GMM222 for low concentrations	0 ... 2000 ppm, 0 ... 3000 ppm, 0 ... 5000 ppm, 0 ... 7000 ppm, 0 ... 10 000 ppm
Accuracy (including repeatability, non-linearity and calibration uncertainty) at 25 °C and 1013 hPa	
GMM221	±(1.5% of range + 2% of reading) (applies for concentrations above 2% of full scale)
GMM222	±(1.5 % of range + 2 % of reading)
Temperature dependence, typical	-0.3 % of reading / °C
Pressure dependence, typical	+0.15% of reading hPa
Long-term stability	<±5 %FS/2 years
Response time (63 %)	
GMM221	20 seconds
GMM222	30 seconds
Warm-up time	30 seconds, 15 minutes full specifications

Inputs and Outputs

Outputs	0 ... 20 or 4 ... 20 mA, 0 ... 1 V, 0 ... 2V, 0 ... 2.5 V, or 0 ... 5 V
Resolution of analog outputs	12 bits
Recommended external load:	
current output	max. 200 Ohm
voltage output	min. 1 kOhm
Operating voltage	11 ... 20 VDC or 18 ... 30 VDC
Connections	screw terminals, wire size 0.5 ... 1.5 mm²
Power consumption	<2.5 W

Operating Environment

Operating temperature	-20 ... +60 °C (-4 ... +140 °F)
Storage temperature	-30 ... +70 °C (-22 ... +158 °F)
Operating pressure	700 ... 1300 hPa
Humidity	
probe	0 ... 100 %RH, non-condensing
mother board	0 ... 85 %RH, non-condensing
Electromagnetic compatibility	Applicable parts of EN61326-1, Generic Environment

Mechanics

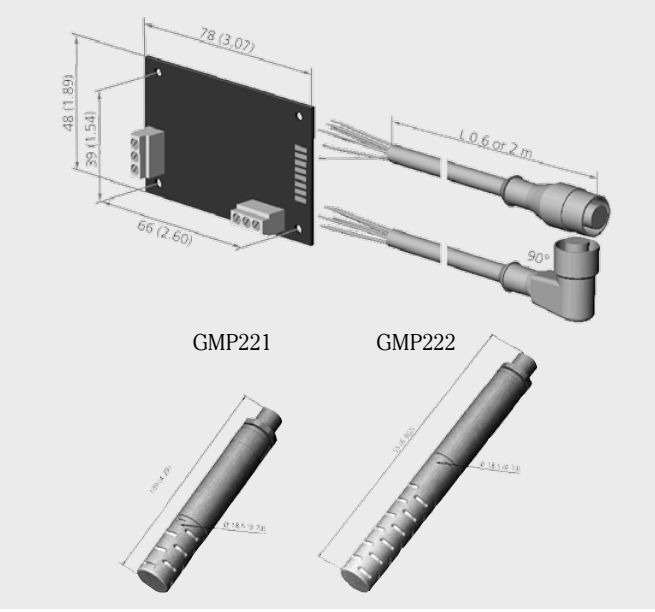
Probe housing material	PC plastic
Housing classification (probe only)	IP65
Weight: GMM221 (w/2m cable)	max. 180 g
Weight: GMM222 (w/2m cable)	max. 200 g
Probe cable length	0.6 m, 1 m (high temperature cable), 2 m, 6 m or 10 m (optional)

Accessories

Spare probe	GMP221, GMP222
(use the order form to define measurement range etc.)	
Clips (2 pcs) for attaching the probe	25245GM
Mounting flange for the probe	GM45156SP
Calibrator for interchangeable probes	GMK220
Probe cables	
1 m high temperature probe cable (180 °C / 365 °F)	GMM220Z100SP
2 m probe cable	GMM220Z200SP
6 m probe cable	GMP343Z600SP
10.0 m probe cable	GMP343Z1000SP
Serial COM adapter	19040GM
Calibration adapter for probe	26150GM

Dimensions

Dimensions in mm (inches)



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GMM111 Carbon Dioxide Module

The Vaisala CARBOCAP® Carbon Dioxide Module GMM111 is a CO_2 measurement module with flow-through aspiration.

Features/Benefits

- Compact CO_2 module with flow-through aspiration
- Ideal for control of CO_2 concentrations in incubators
- Incorporates Vaisala CARBOCAP®, the silicon based NDIR sensor with unique internal referencing
- Advanced single-beam, dual wavelength measurement with no moving parts
- Measurement range options 0 ... 5 %, 0 ... 10 % and 0 ... 20 % CO_2
- Excellent long-term stability

The Vaisala CARBOCAP® Carbon Dioxide Module GMM111 is designed especially for control of biological processes where high CO_2 concentrations are used. It has 3 optional measurement ranges 0 ... 5/10/20 % CO_2. The GMM111 is a flow-through model and has barbed connectors for attaching the in and out flow tubes. As the module is not mounted in the chamber, the chamber can be heatsterilized without removing the module.

The Vaisala CARBOCAP® CO_2 sensors have been proven to be accurate and durable. They have an excellent long-term stability, which decreases maintenance. The superior performance of Vaisala CARBOCAP® sensors results largely from the stable reference provided by the electrically tunable Fabry-Perot Interferometer(FPI).

The tunable FPI filter measures CO_2 absorption, and simultaneously a reference wavelength. This internal reference measurement compensates effectively for any changes in the optical path, such as light source intensity changes and contamination. In the HVAC market, this type of reference measurement is a unique feature to Vaisala CARBOCAP® products.

The true internal reference measurement of Vaisala CARBOCAP® CO_2 transmitters provides years of stable CO_2 measurements.

Technical Data

Performance

CO_2 measurement range	0 ... 5 %, 0 ... 10 % or 0 ... 20 %
Accuracy (including repeatability, non-linearity and calibration uncertainty)	±(1.5% of range + 3 % of reading)
Long-term stability	
0 ... 8 $\%CO_2$	±0.5 $\%CO_2$/year
8 ... 12 $\%CO_2$	±1 $\%CO_2$/year
12 ... 20 $\%CO_2$	±2 $\%CO_2$/year
Response time T_{90}	< 1 min, when flow > 0.2 l/min
Flow rate dependence	
< 1 l/min flow	no effect
1 ... 10 l/min flow	4 % of reading/ l/min
Temperature dependence, typical	-0.3 % of reading/°C
Pressure dependence, typical	+0.15 % of reading/hPa
Warm-up time	1 min, 10 min for full specifications

Operating Environment

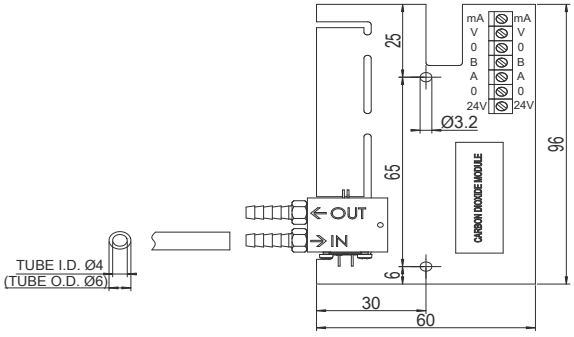
Temperature	+5 ... +55 °C (+41 ... +131 °F)
Humidity	0 ... 99 %RH non-condensing
Pressure	700 ... 1200 hPa
Gas flow	
operating range	< 10 l/min
recommended range	0.2 ... 0.8 l/min
Electromagnetic compatibility	Applicable parts of EN61326-1, Generic Environment

Inputs and Outputs

Outputs	4 ... 20 mA, 0 ... 10 V RS485, 2-wire, non-isolated
Operating voltage	24 V (±20 %) AC/DC
Power consumption	<2 W

Dimensions

Dimensions in mm



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GM70 Hand-Held Carbon Dioxide Meter for Spot-Checking Applications

The Vaisala CARBOCAP® Hand-Held Carbon Dioxide Meter GM70 is the demanding professional's choice for hand-held carbon dioxide measurement. The meter consists of the indicator (center) and probe, used either with the handle (left) or pump (right).

Features/Benefits

- Proven Vaisala CARBOCAP® reliability
- Two optional sampling methods: diffusion or pump aspiration
- User-friendly meter with multilingual user interface
- Numerical and graphical display of measurements
- Data can be logged and transferred to PC via MI70 Link software
- Wide selection of measurement ranges
- Easy recalibration using the interchangeable probes
- Suitable for field checking of fixed CO_2 instruments
- Short warm-up time
- Compact and versatile

The Vaisala CARBOCAP® Hand-Held Carbon Dioxide Meter GM70 is a user-friendly meter for demanding spot measurements in laboratories, greenhouses and mushroom farms. The meter can also be used in HVAC and industrial applications, and as a tool for checking fixed CO_2 instruments.

The GM70 has a short warm-up time and is ready for use almost immediately. It has a menu-based interface, a graphical LCD display and data logging capability. The optional MI70 Link Windows® software in combination with a USB connection cable provides an easy way to handle data in a PC environment.

Vaisala CARBOCAP® Technology

The GM70 incorporates the advanced Vaisala CARBOCAP® sensor that has unique reference measurement capabilities. The measurement accuracy is not affected by dust, water vapor or most chemicals. The GM70 has a two-year recommended calibration interval.

Two Sampling Methods

The handle is for hand-held diffusion sampling. The GM70 pump enables pump-aspirated sampling from locations difficult to access otherwise. It is also ideal for comparisons with fixed CO_2 transmitters.

Interchangeable Probes

The GM70 uses the same probes as Vaisala CARBOCAP® Carbon Dioxide Transmitter Series GMT220 and Modules Series GMM220. By plugging different probes into the handle or pump, the user can easily change the measurement range of the GM70.

The meter can also be used as a calibration check instrument for Vaisala's GM20 and series, GMT/M220 fixed CO_2 instruments. GMP220 probes can even be adjusted by using the GM70 meter.

The GM70 has two probe inputs. Vaisala's relative humidity and dewpoint probes can also be used simultaneously with CO_2 measurement.

Technical Data

CO_2 Volume Concentration Measurement

Measurement ranges	
High concentrations	0 ... 2 %
short probe (GMP221)	0 ... 3 %
	0 ... 5 %, 0 ... 10 %, 0 ... 20 %
Low concentrations	0 ... 2000 ppm
long probe (GMP222)	0 ... 3000 ppm, 0 ... 5000 ppm,
	0 ... 7000 ppm, 0 ... 10,000 ppm
Accuracy (including repeatability, non-linearity and calibration uncertainty) at 25 °C and 1013 hPa	
GMP221	±(1.5% of range + 2% of reading)
(applies for concentrations above 2% of full scale)	
GMP222	±(1.5% of range + 2% of reading)
Temperature dependence, typical	-0.3 % of reading / °C
Pressure dependence, typical	+0.15% of reading/hPa
Long-term stability	<±5 %FS/2 years
Response time (63 %)	
GMP221	20 seconds
GMP222	30 seconds
Warm-up time	30 seconds, 15 minute full specifications

Measurement Environment

Temperature	-20 ... +60 °C (-4 ... +140 °F)
Relative humidity	0 ... 100 %RH non-condensing
Operation pressure	700 ... 1300 hPa
Flow range (diffusion sampling)	0 ... 10 m/s

Probe, Handle & Pump General

Sensor	Vaisala CARBOCAP®
Housing material	
GMP221/222 probe	PC plastic
GMH70 handle	ABS/PC blend
GM70 Pump	aluminium casing
Storage temperature	-30 ... +70 °C (-22 ... +158 °F)
Storage humidity	0 ... 100 %RH non-condensing
Weight	
GMH70 with GMP221/222 probe	230 g
GM70 Pump with GMP221/222 probe	700 g

MI70 Indicator General

Menu languages	English, Chinese, French, Spanish, German,Japanese, Russian, Swedish, Finnish
Display	LCD with backlight, graphic trend display of any parameter, character height up to 16 mm
Max. no. of probes	2
Power supply	Rechargeable NiMH battery pack with AC-adapter
Analog output	0 ... 1 VDC
Output resolution	0.6 mV
PC interface	MI70 Link software with USB or serial port cable
Data logging capacity	2700 points
Alarm	Audible alarm function
Operating temperature range	-10 ... +40 °C (+14 ... +104 °F)
Operating humidity range	non-condensing
Housing material	ABS/PC blend
Housing classification	IP54
Weight	400 g

Battery Operation Time

Continuous use	
with handle	better than 8h at +20 °C (+68 °F)
with pump	better than 5h at +20 °C (+68 °F) without load
Data logging use	up to a month, depending on logging interval

Electromagnetic Compatibility

EN 61326-1, Portable Equipment.

Accessories

Connection cable for fixed CO_2 instruments	
GMT220, GMM220, GMD20 and GMW20	GMA70
MI70 Link software with USB cable	219687
MI70 Link software with serial port cable	MI70LINK
Analog output cable for 0 ... 1 VDC	27168ZZ
Calibration adapter	26150GM
Carrying case	MI70CASE
Battery, NiMH 4.8V	26755
Spare probe	GMP221, GMP222
(use the order form to define measurement range etc.)	
Nafion Membrane Tubing	212807GM

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GMW90 Series Carbon Dioxide, Temperature, and Humidity Transmitters for Demand Controlled Ventilation Applications

GMW90 Series Carbon Dioxide, Temperature and Humidity Transmitters for HVAC are available with either a display opening or a solid front. An optional traffic light indication can also be selected.

Features/Benefits

- Measured parameters: carbon dioxide, temperature, and humidity (optional)
- Superior long-term stability with the next generation Vaisala CARBOCAP® sensor
- Accurate temperature and humidity measurements in a three-parameter instrument due to the low-power microglow infrared source
- Quick and easy installation and maintenance
- Calibrated, user-exchangeable modules for carbon dioxide, temperature and humidity
- 3-point traceable CO_2 calibration (certification included)
- Both analog and digital communication (BACnet/Modbus)

The Vaisala GMW90 Series CARBOCAP® Carbon Dioxide, Temperature, and Humidity Transmitters are based on new measurement technology for improved reliability and stability. With the new technology the transmitter's inspection interval is extended to five years.

Designed for demand controlled ventilation, these transmitters measure carbon dioxide and temperature, with the option for humidity measurements. The instruments come with a calibration certificate that meets traceability and compliance requirements.

Reliability from Unique Measurement Technology

The GMW90 Series Transmitters use advanced Micro-Electro-Mechanical System (MEMS) technology for measuring carbon dioxide. The CARBOCAP® carbon dioxide sensor's continuous reference measurement enables reliable and accurate readings and outstanding long-term stability also in buildings with round-the-clock occupancy.

The new generation CARBOCAP® sensor no longer uses an incandescent light bulb, which limits sensor lifetime. This unique sensor consumes very little power compared to other sensors on the market. As a result, instrument self-heating is low and humidity and temperature can be measured correctly.

Convenient Installation

GMW90 Series Transmitters have been designed for quick and easy installation and maintenance. Every model includes a display for easy startup and convenient maintenance. To protect the sensor from dust and dirt during construction and installation, the units can be cabled with back-plate only. Electronics can be snapped on later at an appropriate phase in the construction project. Dip switches make it quick and easy to configure the transmitters.

Easy Calibration

Regular instrument maintenance guarantees a long product lifetime. Calibration is easiest done with the exchangeable measurement modules. Sensor traceability and measurement quality is easily maintained by snapping on a new module calibrated at Vaisala factory. The instrument can also be calibrated using a hand-held meter or reference gas CO_2bottle. The service interfaces are easy to reach by simply sliding the cover down. The closed cover keeps the measurement environment stable during calibration and ensures a top-quality final result.

Make the transmitter blend into your interior design with the optional decorative cover.

Technical Data

Models

GMW93	CO_2+T	3-wire, voltage output
GMW93D	CO_2+T	3-wire, voltage output with display
GMW94	CO_2+T	3-wire, current output
GMW94D	CO_2+T	3-wire, current output with display
GMW93R	CO_2+T+RH	3-wire, voltage output
GMW93RD	CO_2+T+RH	3-wire, voltage output with display
GMW93RA	CO_2+T+RH	3-wire, voltage output with display and CO_2 indicator LEDs
GMW94R	CO_2+T+RH	3-wire, current output
GMW94RD	CO_2+T+RH	3-wire, current output with display
GMW95	CO_2+T	Digital (BACnet/Modbus) model
GMW95D	CO_2+T	Digital (BACnet/Modbus) model with display
GMW95R	CO_2+T+RH	Digital (BACnet/Modbus) model
GMW95RD	CO_2+T+RH	Digital (BACnet/Modbus) model with display
GMW90	CO_2+T	Configurable analog/digital models
GMW90R	CO_2+T+RH	Configurable analog/digital models

Performance

CARBON DIOXIDE	
Measurement range	0 … 5000 ppm
Accuracy	
+20 ... +30 °C (+ 68 ... + 86 °F)	± (30 ppm + 2 % of reading)
+10 ... +20 °C, +30 ... +40 °C (+50 ... +68 °F, +86 ... +104 °F)	± (35 ppm + 2.7 % of reading)
-5 ... +10 °C, +40 ... +55 °C (+23 ... +50 °F, +104 ... +131 °F)	± (45 ppm + 3.8 % of reading)
Stability in typical HVAC applications	Total accuracy at room temperature ±75 ppm at 600 and 1000 ppm incl. 5 years drift*
Carbon dioxide sensor	Vaisala CARBOCAP® GM10
TEMPERATURE	
Measurement range	-5 ... +55 °C (+23 ... +131 °F)
Accuracy	
+20 ... +30 °C (+68 ... +86 °F)	±0.5 °C (± 0.9 °F)
+10 ... +20 °C, +30 ... +40 °C (+50 ... +68 °F, +86 ... +104 °F)	±0.6 °C (± 1.08 °F)
-5 ... +10 °C, +40...+55 °C (+23 ... +50 °F, +104 ... +131 °F)	±0.8 °C (± 1.44 °F)
Temperature sensor	Digital temperature sensor
RELATIVE HUMIDITY	
Measurement range	0 ... 95 %RH
Accuracy	
Temperature range	+10 ... +40 °C (+50 ... +104 °F)
0 ... 60 %RH	±2.5 %RH
60 … 80 %RH	±3.0 %RH
80 ... 95 %RH	±4.0 %RH
Temperature range	-5 ... +10 °C, +40 ... + 55 °C (+23 ... +50 °F, +104 ... +131 °F)
0 ... 60 %RH	±3.5 %RH
60 … 80 %RH	±4.0 %RH
80 ... 95 %RH	±5.0 %RH
Stability in typical HVAC applications	±0.5 %RH/year
Humidity sensor	Vaisala HUMICAP® 180R

*Complies with CEC-400-2008-001-CMF

Operating Environment

Operating temperature range	-5 ... +55 °C (+23 ... +131 °F)
Operating humidity range	0 … 95 %RH Dewpoint <30 °C (+86 °F)
Storage temperature range	-30 ... +60 °C (-22 ... +140 °F)
Electromagnetic compliance	EN61326-1, Industrial Environment

Spare Parts and Accessories

CO_2 module	GM10SP
Temperature Module (CO_2+T models)	TM10SP
Humidity and Temperature Module (CO_2+T+RH models)	HTM10SP
Decorative cover set (10 pcs.)	236285
Connection cable for HM70 hand-held meter	219980
USB cable for PC connection	219690

Mechanics

IP class	IP30
Standard housing color	White (RAL9003*)
Housing material	ABS/PC, UL-V0 approved
Output connector	Screw terminals max. wire size 2 mm^2 (AWG14)
Service port connector	4-pin M8
Weight	163 g

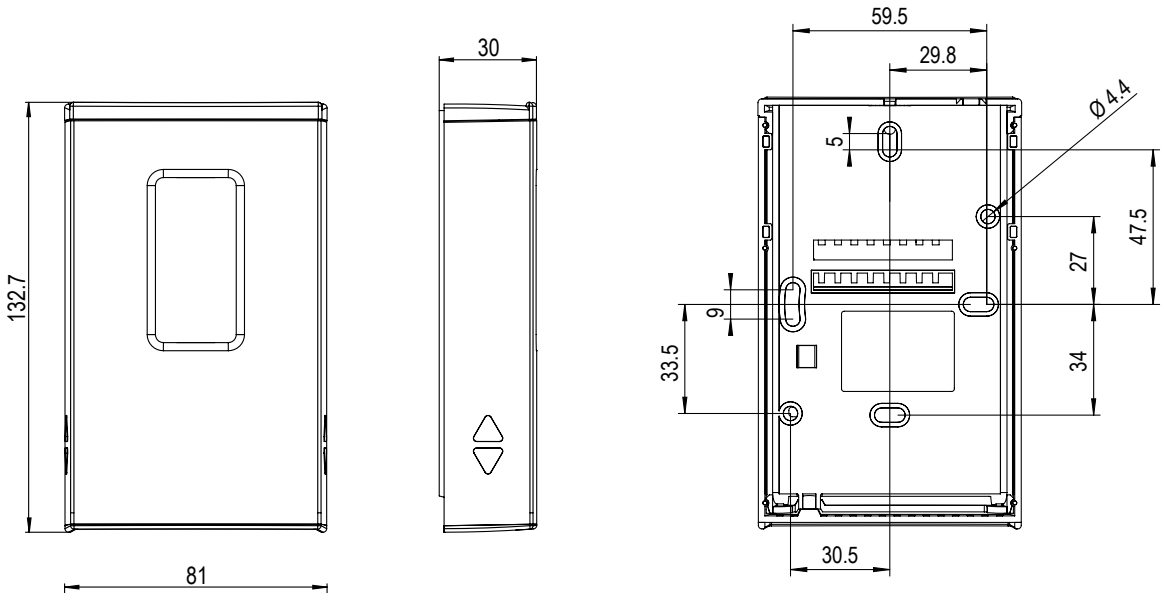
*RAL code is only indicative with potential small variations in color shade

Inputs and Outputs

Supply voltage	18 … 35 VDC, 24 VAC ± 20% 50/60 Hz
Current output models	
Outputs	0/4…20 mA, 2 and 3 channel models available
Loop resistance	0…600 Ω
Power consumption	<2W
Voltage output models	
Outputs	0…5/10 V, 2 and 3 channel models available
Load resistance	10 kΩ min.
Power consumption	<1W
Digital models	
Power consumption	<1.5W
Output type	RS-485 (galvanic isolation, 1.5 kV)
RS-485 end of line termination	Enable with jumper, 120 Ω
Supported protocols	Selectable by DIP switch
BACnet MS/TP	
Operating mode	Selectable Master/Slave
Address range, master mode	0 … 127
Address range, slave mode	128…255
Modbus RTU	
Address range	0 … 247
Service port	RS-485 line for temporary service use

Dimensions

Dimensions in mm



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Decorative Cover for Vaisala GMW90 and HMW90 Series Transmitters

The decorative cover helps to camouflage the transmitter to the surroundings. Transmitter location can be chosen with optimal measurement in mind without compromising aesthetics.

GMW116 Carbon Dioxide and Temperature Transmitter for Ventilation Control

The Vaisala CARBOCAP® Carbon Dioxide and Temperature Transmitter GMW116.

Features/Benefits

- Compact dual-parameter transmitter: measures both CO_2 and T
- Incorporates Vaisala CARBOCAP®, the silicon based NDIR sensor with unique internal referencing
- Advanced, single-beam, dual wavelength measurement with no moving parts
- Excellent long-term stability
- Ideal for ventilation control in all types of occupied spaces including those with around-the-clock occupancy
- No need for temperature compensation

The Vaisala CARBOCAP® Carbon Dioxide and Temperature Transmitter GMW116 is the compact-size transmitter that measures both carbon dioxide and temperature. The sensor is accurate and durable and it has an excellent long-term stability, which decreases maintenance.

The excellent performance of the Vaisala CARBOCAP® sensors results largely from the stable reference provided by the electrically tunable Fabry-Perot Interferometer (FPI).

In buildings with around-the-clock occupancy (e.g. hospitals, work-places, residential buildings, retirement homes), the assumed background CO_2 level reference is simply not applicable. The true internal reference measurement of Vaisala CARBOCAP® CO_2 transmitters provides years of stable CO_2 measurements.

The GMW116 Transmitter is designed especially for demand controlled ventilation applications with CO_2 measurement range of 0 … 2000 ppm and temperature range of 0 ... +50 °C.

With GMW116 there is no need for temperature compensation. The ideal gas temperature behaviour is taken into account automatically.

Technical Data

Performance

CO_2-measurement range	0 ... 2000 ppm
Temperature measurement range	0 ... +50 °C
Accuracy (including repeatability, non-linearity and calibration uncertainty)	± (2 % of range + 2 % of reading
Long-term stability	± 5 % of range/5 years
Response time T90	1 min
Temperature dependence	compensated
Pressure dependence, typical	+0.15 % of reading/hPa
Temperature measurement accuracy	± 0.7 °C at 25 °
Warm-up time	1 min, 10 min for full. specification
Product lifetime	> 10 years

Operating Environment

Temperature	0 ... +50 °C
Humidity	0 ... 85 %RH
Pressure	700 ... 1200 hPa
Electromagnectic compatibility	
Complies with EMS standard EN61326-1, Generic Environment	

Inputs and Outputs

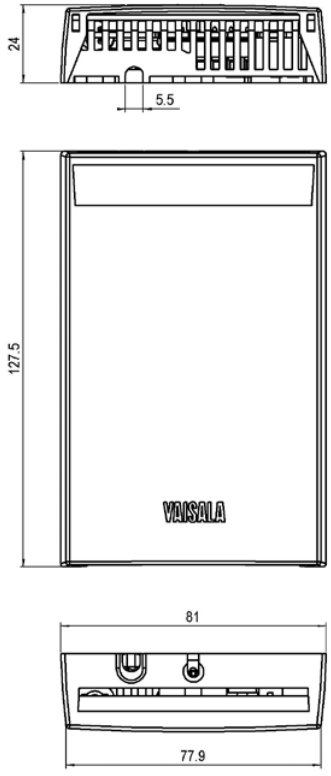
Operating voltage	24 V (±20 %) AC/DC
Power consumption	<2 W
Outputs	0 … 10 V

Housing

Material	ABS/PC blend plastics
Weight	120 g
Cover and base colour	white RAL 9003
Fire resistance	UL94 V0
Ingress protection	IP30

Dimensions

Dimensions in mm



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GMW115 Carbon Dioxide Transmitter for Demand Controlled Ventilation

The Vaisala CARBOCAP® Carbon Dioxide Transmitter GMW115 is a wall-mounted CO_2 transmitter for demand controlled ventilation.

Features/Benefits

- Compact, wall-mounted transmitter for demand controlled ventilation
- Incorporates Vaisala CARBOCAP®, the silicon based NDIR sensor with unique internal referencing
- Advanced, single-beam, dual wavelength measurement with no moving parts
- Excellent long-term stability
- Ideal for ventilation control in all types of occupied spaces

The wall-mounted Vaisala CARBOCAP® Carbon Dioxide Transmitter GMW115 is a compact transmitter for measuring room carbon dioxide levels in building automation applications.

Room carbon dioxide level is an indicator for indoor air quality and human presence. It can be used to steer ventilation to introduce an adequate (but not excess) air flow based on the true need for fresh air. Demand controlled ventilation is well suited to buildings and premises where occupancy varies. Examples of such facilities are schools, offices, meeting rooms, auditoriums, and sports arenas.

The GMW115 transmitter is designed for indoor use in various demand controlled applications. The transmitter is easy to install and needs practically no maintenance. There are two optional ranges of 0…2 000 ppm and 0…5 000 ppm to select from.

Proven Performance with the Vaisala CARBOCAP® Sensor

The GMW115 transmitter uses Vaisala CARBOCAP® carbon dioxide sensor, a silicon-based infrared (IR) absorption sensor. The excellent long-term stability of the CARBOCAP® sensor results from its unique measurement technology. The sensor features an electrically tunable Fabry-Perot Interferometer for built-in reference measurement. The sensor not only measures CO_2 absorption but also a reference, which makes it possible to compensate for potential light intensity variations and contamination and dirt accumulation in the optical path, making the sensor extremely stable over time.

CARBOCAP sensor has no need for any compensation algorithms that are used in more simple sensors to compensate for their drift. In buildings with around-the-clock occupancy (e.g. hospitals, manufacturing facilities, residential buildings, and retirement homes) the compensations based on assumed background carbon dioxide level simply do not work.

Technical Data

Performance

CO_2-measurement range	0 ... 2000 ppm 0.....5000 ppm
Accuracy (including repeatability, non-linearity and calibration uncertainty)	±(2 % of range + 2 % of reading)
Long-term stability	± 5 % of range/5 years
Response time T90	1 min
Temperature dependence, typical	-0,35 % of reading / °C
Pressure dependence, typical	+0,15 % of reading/hPa
Warm-up time	1 min, 10 min for full. specification
Product lifetime	> 10 years

Operating Environment

Temperature	-5 ... +45 °C (23 ... 113 °F)
Humidity	0 ... 85 %RH
Pressure	700 ... 1200 hPa
Electromagnectic compatibility	
Complies with EMS standard EN61326-1, Generic Environment	

Inputs and Outputs

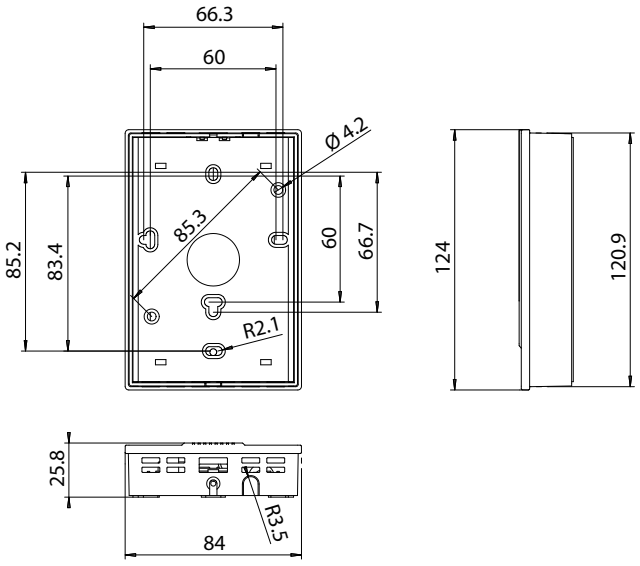
Operating voltage	24 V (±20 %) AC/DC
Power consumption	<2 W
Outputs	4 … 20 mA, 0 … 10 V, RS-485, 2-wire, non-isolated

Housing

Material:	ABS plastics
Colour:	Cycolac 233599/NCS 0502-G50Y
Fire resistance:	UL94 HB
Ingress protection:	IP30

Dimensions

Dimensions in mm



Carbon Dioxide

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GMD/W20 Series Carbon Dioxide Transmitters for Demand Controlled Ventilation Applications

The GMD/W20 series transmitters are designed for use in ventilation-related applications.

Features/Benefits

- Versatile transmitters
- Duct and wall mount models
- Incorporates Vaisala CARBOCAP® Sensor - the silicon-based NDIR sensor
- Excellent long-term stability
- Negligible temperature dependence
- Ease of installation

The duct mounted Vaisala CARBOCAP® Carbon Dioxide Transmitter Series GMD20 and wall mounted GMW20 are specially designed for Demand Controlled Ventilation (DCV). They are easy to install and require no maintenance. The recommended calibration interval is five years.

Vaisala CARBOCAP® Technology

The GMD/W20 Series Transmitters use the silicon-based Vaisala CARBOCAP® Sensor. The simple structure and reference measurement capabilities make this Single-Beam, Dual-Wavelength NDIR sensor extremely stable and reliable.

The temperature and flow dependences of the sensor are negligible. In addition, the measurement accuracy is not affected by dust, water vapor and most chemicals.

Versatile Transmitters

The GMD/W20 series transmitters can be used independently, or incorporated into building energy management systems. The series consists of duct mount units GMD20/D and wall mount units GMW21/D and GMW22/D. Version D has a display. The two sizes in the wall-mount series make them easy to install for most standard junction boxes.

The duct units' compact sensor head design requires only a small hole in a ventilation duct, thereby minimizing the risk of leaking gaskets and measurement errors.

In addition to the standard 0 ... 20 mA, 4 ... 20 mA and 0 ... 10 V outputs, there are three other options: two LonWorks® interfaces and a relay output. The relay output is standard with the display units.

Improve Indoor Air at Minimal Energy Costs

The use of the GMD/W20 series transmitters ensures the best possible control of air quality and results in considerable savings in energy consumption, maintenance and recalibration costs.

Temperature Option

The GMA20T temperature module, an option with the GMW21 wall mount unit, combines both CO_2 and temperature measurement into one transmitter. The GMA20T has an output of 0 ... 10 V corresponding to a temperature range of 0 ... +50 °C (+32 ... +122 °F).

Technical Data

Performance

CARBON DIOXIDE MEASUREMENT	
Measurement range	0 ... 2000 ppm (nominal; can be calibrated for other ranges: 0 ... 5000 ppm, 0 ... 10,000 ppm, 0 ... 20,000 ppm)
Accuracy (including repeatability, non-linearity and calibration uncertainty)	± (2 % of range + 2% of reading)
Long-term stability	<±5 % of range / 5 years
Response time (63%)	1 minute
Warm-up time	1 minute, 15 minutes full specifications
TEMPERATURE MEASUREMENT (OPTIONAL WITH GMW21)	
Output signal	0 ... 10V
Corresponding measurement range	0 ... +50 °C (+32 ... +122 °F)
Accuracy at +25 °C	±0.5 °C (0.9 °F)
Warm up time	30 min
Temperature sensor	Semiconductor IC

Inputs and Outputs

Outputs	0 ... 20 or 4 ... 20 mA and 0 ... 10 V
Optional outputs	relay LonWorks® interface
Resolution of analog outputs	8 bits
Recommended external load:	
current output	max. 500 ohm
voltage output	min. 1 kohm
Operating voltage	nominal 24 VAC/DC (18 ... 30 VDC)
Connections	screw terminals, wire size 0.5 ... 1.5 mm^2
Power consumption	<2.5 W

Operating Environment

Temperature	-5 ... +45 °C (+23 ... +113 °F)
Humidity	0 ... 85 %RH, non-condensing
Flow velocity (GMD20)	0 ... 10 m/s
Electromagnetic compatibility	EN61326-1, Generic Environment

Mechanics

Housing material	ABS plastic
Housing classification (GMD20 electronics housing)	IP65
Housing colour GMW21/22	NCS 0502-G50Y
Weight:	
GMD20 (D)	140 g (170 g)
GMW21 (D)	100 g (130 g)
GMW22 (D)	90 g (120 g)

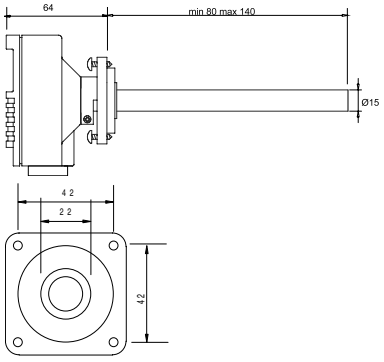
Accessories and Options

Display and relay option for GMD/W21/22	GMI21
Relay output option	GMR20
LonWorks® module with CO_2 signal (Not available when display option is added)	GML20
LonWorks® module with both CO_2 signal and temperature signals (Not available when display option is added)	GML20T
Serial COM adapter	19040GM
Analog temperature module for GMW21 (not available when display option is added)	GMA20T
Hand-held meter for field verification	GM70

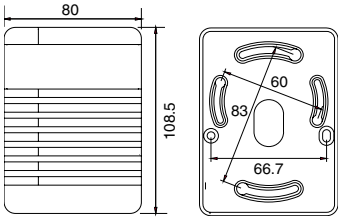
Dimensions

Dimensions in mm

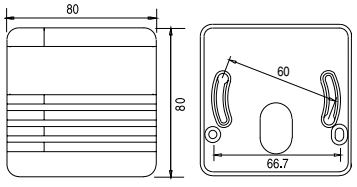
GMD20 and GMD20D



GMW21 and GMW21D



GMW22 and GMW22D



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GMM112 Carbon Dioxide Module for HVAC Applications

The Vaisala CARBOCAP® Carbon Dioxide Module GMM112 is a basic CO_2 measurement module.

Features/Benefits

- Compact OEM module for demand controlled ventilation and other CO_2 measurement applications
- Incorporates Vaisala CARBOCAP®, the silicon based NDIR sensor with unique internal referencing
- Advanced, single-beam, dual wavelength measurement with no moving parts
- Excellent long-term stability
- Ideal for ventilation control in all types of occupied spaces

The Vaisala CARBOCAP® Carbon Dioxide Module GMM112 is a compact module for measuring ppm (parts per million) levels of carbon dioxide. The GMM112 module is designed for indoor use in demand controlled ventilation and other applications requiring carbon dioxide control.

The GMM112 has three optional ranges to select from: 0…2 000 ppm, 0…5 000 ppm and 0…10 000 ppm. The selectable analog (current and voltage) and digital outputs make it easy to integrate to various control systems. The GMM112 modules are easy to install and need practically no maintenance.

Proven Performance with the Vaisala CARBOCAP® Sensor

The GMM112 module includes Vaisala CARBOCAP® carbon dioxide sensor, a silicon-based infrared (IR) absorption sensor. The excellent long-term stability of the CARBOCAP® sensor results from its unique measurement technology. The sensor features an electrically tunable Fabry-Perot Interferometer for built-in reference measurement. The sensor not only measures CO2 absorption but also a reference, which makes it possible to compensate for potential light intensity variations and contamination and dirt accumulation in the optical path, making the sensor extremely stable over time.

CARBOCAP sensor has no need for any compensation algorithms that are used in more simple sensors to compensate for their drift. In applications with constant elevated levels of carbon dioxide and in buildings with around-the-clock occupancy (e.g. hospitals, manufacturing facilities, residential buildings, and retirement homes) the compensations based on assumed background carbon dioxide level simply do not work.

Technical Data

Performance

CO_2-measurement range	0 ... 2000 ppm 0 ... 5000 ppm 0 ... 10000 ppm
Accuracy (including repeatability, non-linearity and calibration uncertainty)	± (2 % of range + 2 % of reading
Long-term stability	± 5 % of range/5 years
Response time T90	1 min
Temperature dependence, typical	-0,35 % of reading / °C
Pressure dependence, typical	+0,15 % of reading/hPa
Warm-up time	1 min, 10 min for full. specification
Product lifetime	> 10 years

Operating Environment

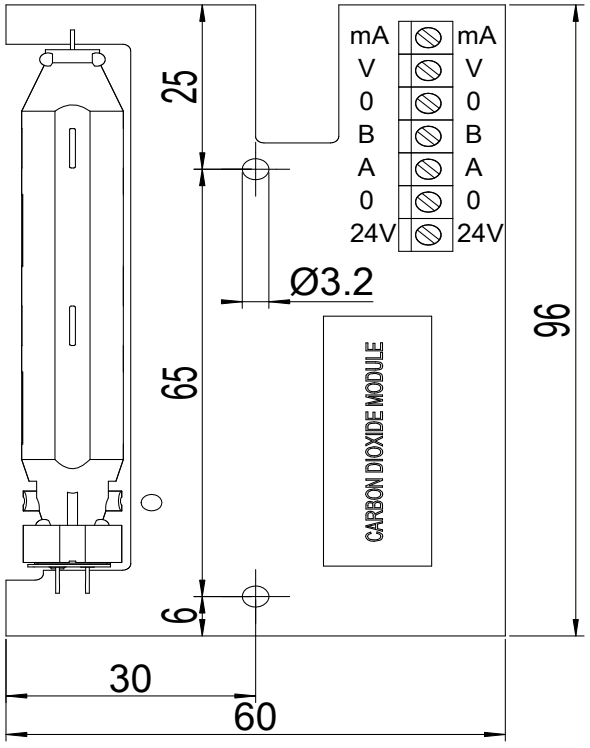
Temperature	-5 ... +45 °C (23 ... 113 °F)
Humidity	0 ... 85 %RH
Pressure	700 ... 1200 hPa
Electromagnectic compatibility	
Complies with EMS standard EN61326-1:1997 + Am1:1998, Generic Environment	

Inputs and Outputs

Operating voltage	24 V (±20 %) AC/DC
Power consumption	<2 W
Outputs	4 … 20 mA, 0 … 10 V, RS-485, 2-wire, non-isolated

Dimensions

Dimensions in mm



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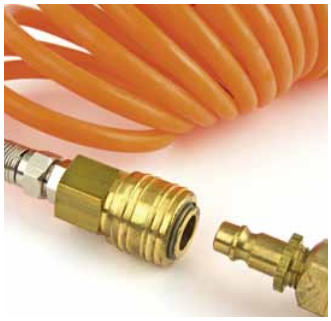
VAISALA / TECHNOLOGY DESCRIPTION

Vaisala BAROCAP® Sensor for Measuring Pressure



First introduced in 1985, Vaisala BAROCAP® is a silicon-based micromechanical pressure sensor that offers reliable performance in a wide variety of applications, from meteorology to industrial measurements. Combining two powerful technologies – single-crystal silicon material and capacitive measurement – BAROCAP sensors feature low hysteresis combined with excellent accuracy and long-term stability.

How It Works

BAROCAP is a micromechanical sensor that uses dimensional changes in its silicon membrane to measure pressure. As the surrounding pressure increases or decreases, the membrane bends, thereby increasing or decreasing the height of the vacuum gap inside the sensor. The opposite sides of the vacuum gap act as electrodes, and as the distance between the two electrodes changes, the sensor capacitance changes. The capacitance is measured and converted into a pressure reading.

The BAROCAP sensor's properties – good elasticity, low hysteresis, excellent repeatability, low temperature dependence, and superior long-term stability – are the result of its single-crystal silicon material. The capacitive structure gives the sensor its wide dynamic range and provides a built-in mechanism for overpressure blocking.

Typical Applications for Barometric Pressure Measurement

Barometric pressure measurement has a wide variety of applications within meteorology. Pressure data is required for estimating the amount of precipitable water vapor in the atmosphere. Typical applications include weather stations, data buoys, GPS meteorology, and environmental data logging. Barometric pressure measurement is also used in hydrology and agrology applications.

Barometric pressure data is also required in several industrial applications. It is measured in pressure-sensitive industrial equipment, such as laser interferometers and lithography systems, aviation applications, and in exhaust-gas analysis. Metrological applications include laboratory pressure standard measurements and environmental monitoring in calibration laboratories.

BAROCAP in Brief

- Over 25 years of accurate pressure measurement
- Silicon-based capacitive sensor for absolute pressure measurement
- Barometric pressure range 500...1100 hPa
- 50...1100 hPa pressure range available for industrial applications
- Process pressure measurement range 1...10 bar
- NIST-traceable pressure measurement

BAROCAP's Unique Benefits

- Low hysteresis, high repeatability
- Superior long-term stability
- Tolerates harsh conditions

Vaisala offers a range of professional-grade barometers for both indoor and outdoor use. BAROCAP barometers operate over a wide temperature range and perform reliably even in highly demanding applications such as professional meteorology and aviation. View the complete range of Vaisala barometers at www.vaisala.com/pressure.

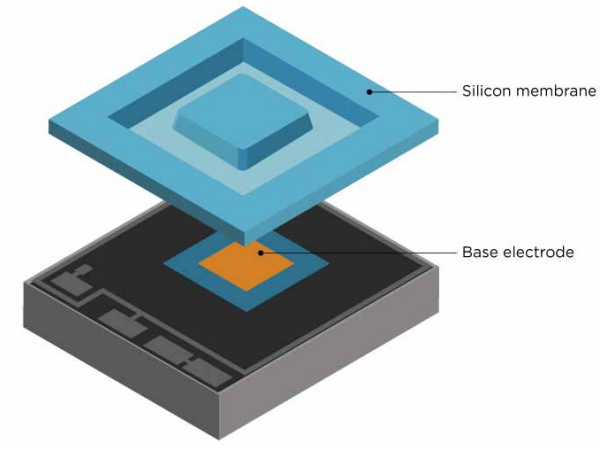
BAROCAP Applications for Measurements in Pressurized Systems

Vaisala DRYCAP® dew point instruments have a long history of providing reliable and stable measurements in compressed air systems and SF6 insulation gas monitoring in high-voltage equipment. In addition to the need for dew point measurement, these two applications also share the need for accurate and stable pressure measurement. Vaisala has integrated its DRYCAP and BAROCAP technologies into a range of products that offer a unique combination of pressure and dew point measurement for pressurized systems.

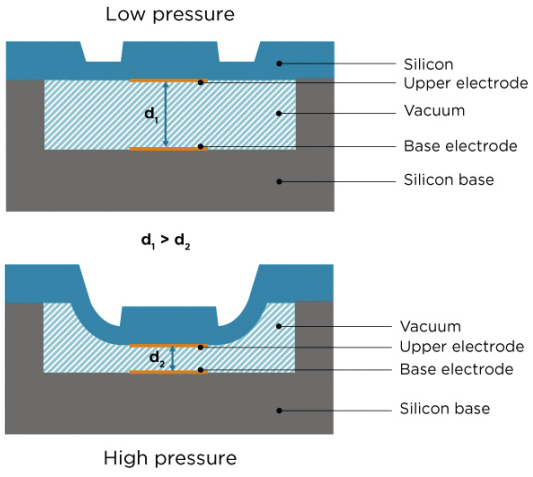
In compressed air, combining dew point measurement with live process pressure data provides a unique advantage: The conversion of measured pressure dew point to atmospheric pressure or ppm unit is available online, eliminating the possibility of any ambiguity in the dew point data. This is important because changes in the pressure of the gas being monitored alter its dew point.

Combined dew point and pressure measurement in SF6 gas monitoring of high-voltage equipment provides a superior tool for assessing the condition of SF6 insulation. Leakages can be immediately detected and early warning is given for moisture issues. Measuring dew point, pressure, and temperature enables the calculation of SF6 gas density, normalized pressure, dew point at atmospheric pressure, and ppm – all essential elements in SF6 monitoring.

View the complete range of Vaisala products for combined pressure and dew point measurement at www.vaisala.com/pressure.



BAROCAP sensor.



Cross-section of the BAROCAP sensor.

The BAROCAP Story

The story of BAROCAP began in the late 1970s during preliminary micromechanical pressure sensor studies for the new-generation Vaisala Radiosonde RS80. Micromechanics proved to be challenging, and Vaisala worked in close cooperation with universities and research institutes in Finland and internationally to develop a new pressure-sensing technology based on silicon processing. The critical breakthrough came on the brink of the project deadline. The first BAROCAP sensors were delivered to two icebreakers and the Helsinki Telephone Company.

BAROCAP sensors have traveled to places where no human has ever set foot, including as part of several Mars exploration missions and the Cassini-Huygens mission to explore Saturn and its largest moon, Titan. BAROCAP's out-of-this-world journey continues with its inclusion in instruments that form part of NASA's Mars Science Laboratory, launched in November 2011.

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PTU300 Combined Pressure, Humidity and Temperature Transmitter for Demanding Applications

The Vaisala Combined Pressure, Humidity and Temperature Transmitter PTU300 is a versatile, multi-purpose instrument.

Features/Benefits

- Barometric pressure, humidity, and temperature measurement in one transmitter
- Available with up to two barometric pressure sensors for added reliability
- RS232C serial interface with NMEA protocol for GPS use
- Graphical display and keypad for convenient operation
- Analog outputs, RS232/485, WLAN/LAN
- MODBUS protocol support (RTU/TCP)
- Optional universal power supply module
- NIST traceable calibration (certificate included)
- HMT330MIK installation kit for outdoor use
- Applications include environmental monitoring in calibration laboratories, industrial applications, GPS meteorology: estimating precipitable water vapor in the atmosphere, weather stations

One Transmitter, Three Measurements

The Vaisala Combined Pressure, Humidity and Temperature Transmitter PTU300 is a unique instrument measuring three parameters simultaneously.

You can choose from the following probe options: PTU301 for laboratories, PTU303 for general use, PTU307 warmed probe for outdoor and demanding meteorology applications, and PTU30T for pressure and temperature measurement only.

Proven Vaisala Sensor Technology

The PTU300 incorporates sensors known for their high accuracy and excellent long-term stability: Vaisala BAROCAP® for pressure measurement and Vaisala HUMICAP® for humidity measurement. The temperature sensor is a platinum RTD sensor.

Graphical Display of Measurement Data and Trends for Convenient Operation

The PTU300 features a large numerical and graphical display with a multilingual menu and keypad. It allows users to easily monitor operational data, measurement trends, and access measurement history for the past 12 months.

The optional data logger, with real-time clock, makes it possible to generate over four years of measurement history and zoom in on any desired time or time frame.

The display alarm allows any measured parameter to be tracked, with freely configurable low and high limits.

Versatile Outputs and Data Collection

The PTU300 comes with a standard RS232 serial interface. The output format is compatible with major GPS receivers and NMEA-coded messages. An isolated RS485 is available as an option.

The PTU300 is also capable of applying the MODBUS communication protocol and, together with an appropriate connection option, provides either MODBUS RTU (RS485) or MODBUS TCP/IP (Ethernet) communication.

The data logger, with real-time clock and battery backup, guarantees reliable logging of measurement data for over four years. The recorded data can be viewed on the local display or transferred to a PC with Microsoft Windows® software. The transmitter can also be connected to a network with an optional (W)LAN interface, which enables a (wireless) Ethernet connection. A USB service cable makes it easy to connect the PTU300 to a PC via the service port.

Outdoor Installation Kit

Outdoor installation is possible using the optional HMT330MIK installation kit, for applications requiring reliable measurements for meteorological purposes.

Flexible Calibration

Quick, one-point field calibration for humidity is easy using the Vaisala Hand-Held Humidity Meter HM70.

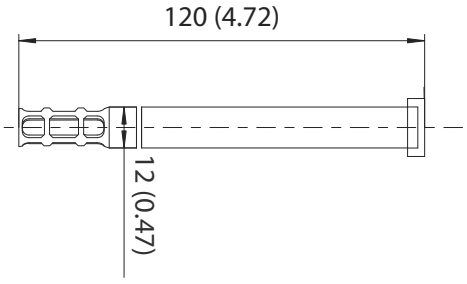
With Vaisala Barometric Pressure Transfer Standard PTB330TS, including optional humidity and temperature probe, field check and calibration can be performed for all three parameters.

PTU300 Models

PTU301 for wall mounting

Dimensions

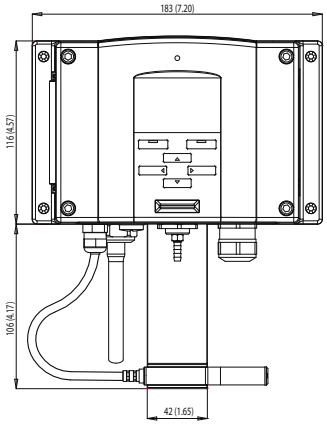
Dimensions in mm (inches)



PTU301 short cable probe with optional WLAN

Dimensions

Dimensions in mm (inches)

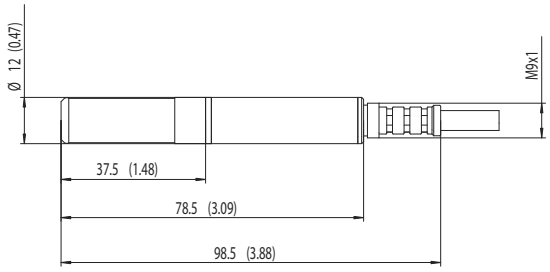


PTU300 Models

PTU303 probe for outdoor use

Dimensions

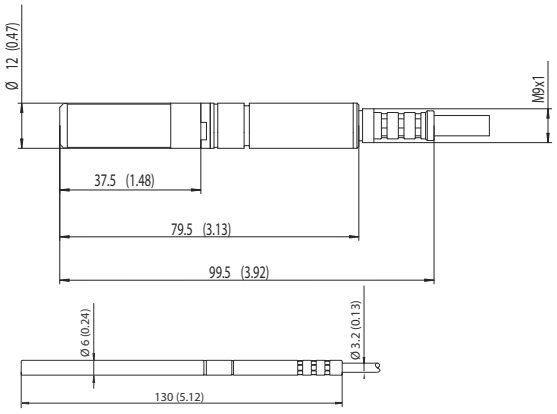
Dimensions in mm (inches)



PTU307 warmed probe for demanding meteorological installations

Dimensions

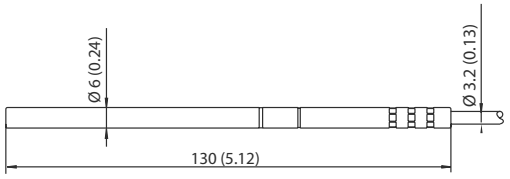
Dimensions in mm (inches)



PTU30T for pressure and temperature only measurement

Dimensions

Dimensions in mm (inches)



Technical Data

Performance

BAROMETRIC PRESSURE

Pressure range		500 ... 1100 hPa, 50 ... 1100 hPa	
Accuracy	500 ... 1100 hPa	500 ... 1100 hPa	50 ... 1100 hPa
	CLASS A	CLASS B	
Linearity	±0.05 hPa	±0.10 hPa	±0.20 hPa
Hysteresis*	±0.03 hPa	±0.03 hPa	±0.08 hPa
Repeatability*	±0.03 hPa	±0.03 hPa	±0.08 hPa
Calibration uncertainty**	±0.07 hPa	±0.15 hPa	±0.20 hPa
Accuracy at +20 °C***	±0.10 hPa	±0.20 hPa	±0.30 hPa
Temperature dependence****	±0.1 hPa	±0.1 hPa	±0.3 hPa
Total accuracy (-40 ... +60 °C/ -40 ... +140 °F)	±0.15 hPa	±0.25 hPa	±0.45 hPa
Long-term stability/year	±0.1 hPa	±0.1 hPa	±0.2 hPa
Response time (100 % response)			
one sensor	2 s·	1 s·	1 s·
Pressure units	hPa, mbar, kPa, Pa, inHg, mmH20, mmHg, torr, psia		

* Defined as ±2 standard deviation limits of endpoint non-linearity, hysteresis error or repeatability error and calibration.

** Defined as ±2 standard deviation limits of accuracy in the working standard including NIST traceability.

*** Defined as the root sum of the squares (RSS) of endpoint non-linearity, hysteresis error, repeatability error and calibration uncertainty at room temperature.

**** Defined as ±2 standard deviation limits of temperature dependence over the operating temperature range.

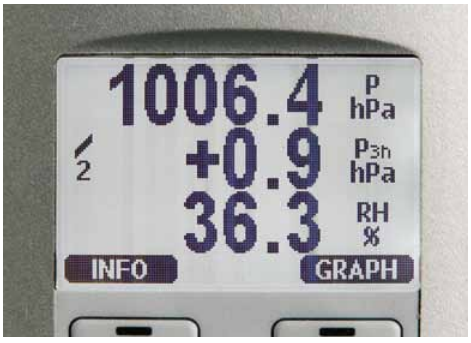
RELATIVE HUMIDITY

Measurement range	0 ... 100 %RH
Accuracy (including non-linearity, hysteresis, and repeatability at	
+15 ... +25 °C	±1 %RH (0 ... 90 %RH)
	±1.7 %RH (90 ... 100 %RH)
at -20 ... +40 °C	±(1.0 + 0.008 x reading) %RH
at -40 ... +60 °C	±(1.5 + 0.015 x reading) %RH
Factory calibration uncertainty (+20 °C)	
(Defined as ±2 standard deviation limits. Small variations possible, see also calibration certificate.)	± 0.6 %RH (0 ... 40 %RH)
	± 1.0 %RH (40 ... 97 %RH)
Sensor	
for typical applications	Vaisala HUMICAP® 180 or 180R*
for applications with chemical purge/warmed probe	Vaisala HUMICAP® 180C or 180RC*
Response time (90%) at +20 °C (+68 °F) in still air	
with grid filter	8 s / 17 s*
with grid + steel netting filter	20 s / 50 s*
with sintered filter	40 s / 60 s*

* with HUMICAP® 180R or 180RC sensor

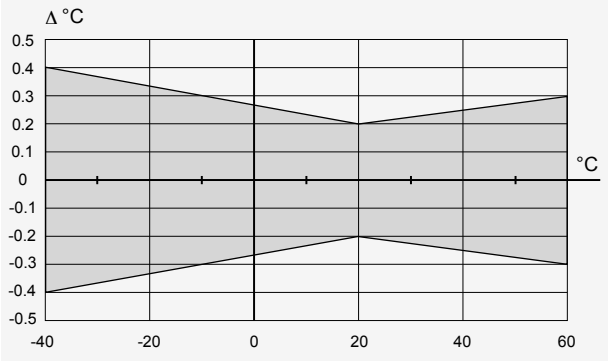
TEMPERATURE

Measurement range, all probes	-40 ... +60 °C (-40 ... +140 °F)
Accuracy at +20 °C (+68 °F)	± 0.2 °C (± 0.4 °F)
Temperature units	°C, °F



The display also shows the WMO pressure trend ΔP 3h and tendency of 0 ... 8.

ACCURACY OVER TEMPERATURE RANGE



Temperature sensor	Pt100 RTD Class F0.1 IEC 60751

Operating Environment

Operating temperature	-40 ... +60 °C (-40 ... +140 °F)
with optional display	0 ... +60 °C (+32 ... +140 °F)
Humidity range	non-condensing
Electromagnetic compatibility	Complies with EMC standard EN61326-1, Industrial Environment
	Note: Transmitter with display test impedance of 40 ohm is used in IEC61000-4-5 (Surge immunity)

Inputs and Outputs

Operating voltage	10 ... 35 VDC, 24 VAC ±20%
with optional power supply module	100 ... 240 VAC, 50/60 Hz
Power consumption at +20 °C (U_{in} 24 VDC)	
RS232	max. 28 mA
U_{out} 3 x 0 ... 1 V/0 ... 5 V/0 ... 10 V	max. 33 mA
I_{out} 3 x 0 ... 20 mA	max. 63 mA
display and backlight	+20 mA
during chemical purge	max. +110 mA
during probe heating	+120 mA
Settling time at power-up (one sensor)	
class A	4 s
class B	3 s
External loads	
current outputs	R_L < 500 ohm
0 ... 1 V output	R_L > 2 kohm
0 ... 5 V and 0 ... 10 V outputs	R_L > 10 kohm

Recommended wire size	0.5 mm² (AWG 20) stranded wires
Digital outputs	RS232, RS485 (optional)
Protocols	ASCII commands, MODBUS RTU
Service connection	RS232, USB
Relay outputs (optional)	0.5 A, 250 VAC
Ethernet interface (optional)	
Supported standards	10BASE-T, 100BASE-TX
Connector	8P8C (RJ45)
IPv4 address assignment	DHCP (automatic), static
Protocols	Telnet, MODBUS TCP/IP
WLAN interface (optional)	
Supported standards	802.11b
Antenna connector type	RP-SMA
IPv4 address assignment	DHCP (automatic), static
Protocols	Telnet, MODBUS TCP/IP
Security	WEP 64/128, WPA2
Authentication / Encryption (WLAN)	
Open / no encryption	
Open / WEP	
WPA Pre-shared key / TKIP	
WPA Pre-shared key / CCMP (a.k.a. WPA2)	
Optional data logger with real-time clock	
Logged parameters	max. four with trend/min/max values
Logging interval	10 sec. (fixed)
Max. logging period	4 years, 5 months
Logged points	13.7 million points per parameter
Battery lifetime	min. 5 years
Display	LCD with backlight, graphical trend display of any parameter
Menu languages	English, Chinese, Finnish, French, German, Japanese, Russian, Spanish, Swedish
Analog outputs (optional)	
current output	0 ... 20 mA, 4 ... 20 mA
voltage output	0 ... 1 V, 0 ... 5 V, 0 ... 10 V
Humidity and temperature	
accuracy at +20 °C	±0.05% full scale
temperature dependence	±0.005%/°C full scale

Pressure	500 ... 1100 hPa	50 ... 1100 hPa
accuracy at +20 °C	±0.30 hPa	±0.40 hPa
accuracy at -40 ... +60 °C	±0.60 hPa	±0.75 hPa

Mechanics

Cable bushing	M20 x 1.5 for cable diameter 8 ... 11 mm/0.31 ... 0.43"
Conduit fitting	1/2" NPT
User cable connector (optional)	M12 series 8-pin (male)
option 1	female plug with 5 m (16.4 ft) black cable
option 2	female plug with screw terminals

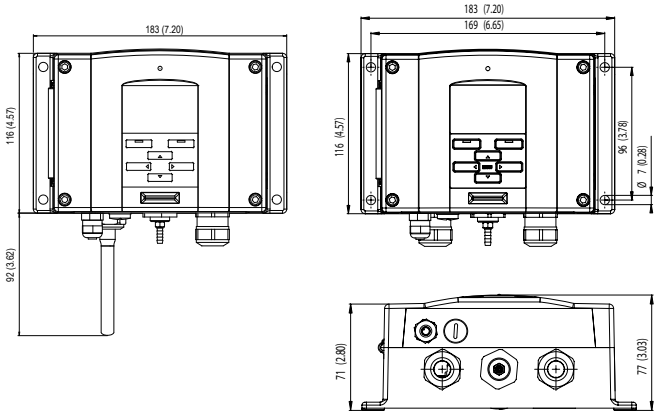
Probe cable diameter	
PTU303	6.0 mm
other probes	5.5 mm
Standard probe cable lengths	2 m, 5 m or 10 m (Additional cable lengths available, please see order form for details)
Housing material	G-AlSi 10 Mg (DIN 1725)
Housing classification	IP 66 IP65 (NEMA4X) with local display
Weight	
depending on selected probe	1.0 - 3.0 kgs

Accessories

PC software and cable	215005
USB-RJ45 Serial Connection Cable	219685
Connection cable for HM70	211339
Wall mounting plate (plastic)	214829
Pole installation kit with rain shield	215109
DIN rail installation set	211477
Duct installation kit, PTU303/307	210697
Cable gland and AGRO, PTU303/307	HMP247CG
Solar radiation shield, PTU303/307/30T	DTR502B
Meteorological installation kit	HMT330MIK
Duct installation kit (T probe)	215003

Dimensions

Dimensions in mm (inches)



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TYPE APPROVED PRODUCT
CERTIFICATE NO.: A-13529

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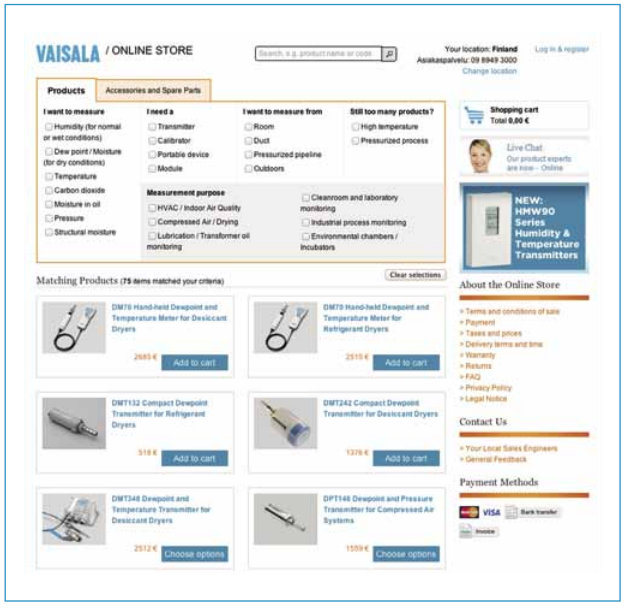

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PTB330 Digital Barometer for Professional Meteorology, Aviation, and Industrial Users

Vaisala BAROCAP® Digital Barometer PTB330 with a new trend display.

Vaisala BAROCAP® Digital Barometer PTB330 is a new generation barometer, designed for a wide range of high-end atmospheric pressure measurement. The pressure measurement of the PTB330 is based on the Vaisala in-house, silicon capacitive, absolute pressure sensor - the Vaisala BAROCAP® Sensor. It provides high measurement accuracy and excellent long-term stability.

Features/Benefits

- Vaisala BAROCAP® sensor
- Accurate measurement
- Excellent long-term stability
- Added reliability through redundancy
- Graphical trend display with 1-year history data
- Height and altitude corrected pressure (QFE, QNH)
- For professional meteorology and aviation, laboratories, demanding industrial applications

Highly Accurate

The PTB330 series is highly accurate. The Class A barometers for the most demanding applications are fine-tuned and calibrated against a high-precision pressure calibrator. Class B barometers are adjusted and calibrated using electronic working standard. All the PTB330 barometers come with a NIST traceable, factory calibration certificate.

Reliability through Redundancy

According to customers' choice, the PTB330 can incorporate one, two or three BAROCAP® sensors. When two or three sensors are used, the barometer continuously compares the readings of the pressure sensors against one another and provides information on whether these are within the set internal difference criteria. This unique feature provides redundancy in pressure measurement.

Thus, users also get a stable and reliable pressure reading at all times as well as a pre-indication of when to service or recalibrate the barometer.

QNH and QFE

The PTB330 can be set to compensate for QNH and QFE pressure used especially in aviation. The QNH represents the pressure reduced to sea level, based on the altitude and temperature of the observation site. The QFE represents the height corrected pressure of small differences in altitude, for example, the air pressure at the airfield elevation.

Graphical Display

The PTB330 features a multi-lingual, graphical display allowing users to monitor measurement trends. The graph is updated automatically while measuring and it provides a one-year measurement history. In addition to instant pressure, the PTB330 also provides the WMO pressure trend and tendency codes.

Applications

The PTB330 can be used successfully for aviation, professional meteorology, and for demanding industrial pressure measurement applications such as accurate laser interferometric measurement and exhaust gas analysis in engine test benches.

Technical Data

Performance

BAROMETRIC PRESSURE RANGE 500 ... 1100 hPa

	Class A	Class B
Linearity*	±0.05 hPa	±0.10 hPa
Hysteresis*	±0.03 hPa	±0.03 hPa
Repeatability*	±0.03 hPa	±0.03 hPa
Calibration uncertainty**	±0.07 hPa	±0.15 hPa
Accuracy at +20 °C (+68 °F) ***	±0.10 hPa	±0.20 hPa

BAROMETRIC PRESSURE RANGE 50 ... 1100 hPa

	Class B
Linearity*	±0.20 hPa
Hysteresis*	±0.08 hPa
Repeatability*	±0.08 hPa
Calibration uncertainty**	±0.15 hPa
Accuracy at +20 °C ***	±0.20 hPa

TEMPERATURE DEPENDENCE****

500 ... 1100 hPa	±0.1 hPa
50 ... 1100 hPa	±0.3 hPa

TOTAL ACCURACY -40 ... +60 °C (-40 ... +140 °F)

	Class A	Class B
500 ... 1100 hPa	±0.15 hPa	±0.25 hPa
50 ... 1100 hPa		±0.45 hPa

LONG-TERM STABILITY

500 ... 1100 hPa	±0.1 hPa/year
50 ... 1100 hPa	±0.1 hPa/year

* Defined as ±2 standard deviation limits of endpoint non-linearity, hysteresis or repeatability error.

** Defined as ±2 standard deviation limits of inaccuracy of the working standard including traceability to NIST.

*** Defined as the root sum of the squares (RSS) of endpoint non-linearity, hysteresis error, repeatability error and calibration uncertainty at room temperature.

**** Defined as ±2 standard deviation limits of temperature dependence over the operating temperature range.

Operating Environment

Pressure range	500 ... 1100 hPa, 50 ... 1100 hPa
Temperature range	
operating	-40 ... +60 °C (-40 ... +140 °F)
with local display	0 ... +60 °C (+32 ... +140 °F)

Data Transfer Software

MI70 Link Interface Software	
Requirement:	Microsoft® Windows OS
	Microsoft® Excel

Inputs and Outputs

Supply voltage	10 ... 35 VDC
Supply voltage sensitivity	negligible
Typical power consumption at +20 °C (U_{in} 24 VDC, one pressure sensor)	
RS-232	25 mA
RS-485	40 mA
U_{out}	25 mA
I_{out}	40 mA
display and backlight	+20 mA
Serial I/O	RS232C, RS485/422
Pressure units	hPa, mbar, kPa, Pa inHg, mmH_20, mmHg, torr, psia

	Class A	Class B
Resolution	0.01 hPa	0.1 hPa
Settling time at power-up (one sensor)	4 s	3 s
Response time (one sensor)	2 s	1 s

Acceleration sensitivity	negligible
Pressure connector	M5 (10-32) internal thread
Pressure fitting	barbed fitting for 1/8" I.D. tubing or quick connector with shutoff valve for 1/8" hose
Maximum pressure limit	5000 hPa abs.
Compliance	EMC standard EN61326-1:1997 + Am1:1998 + Am2:2001: Industrial Environment

Mechanics

Housing material	G AlSi10 Mg (DIN 1725)
Housing classification	IP66
	IP65 (NEMA4) with local display
Weight	1 - 1.5 kg

Analog Output (optional)

Current output		0 ... 20 mA, 4 ... 20 mA
Voltage output		0 ... 1 V, 0 ... 5 V, 0 ... 10 V
Accuracy at pressure range	500 ... 1100 hPa	50 ... 1100 hPa
at +20 °C	±0.30 hPa	±0.40 hPa
at -40 ... +60 °C	±0.60 hPa	±0.75 hPa

Accessories

Serial interface cable	19446ZZ
USB-RJ45 serial connection cable	219685
Software interface kit	215005
Wall mounting kit	214829
Outdoor installation kit (weather shield)	215109
Installation kit for pole or pipeline	215108
Power supply module	POWER-1
Temperature compensated analog output module	AOUT-1T
Isolated RS-485 module	RS485-1
DIN Rail Kit	215094

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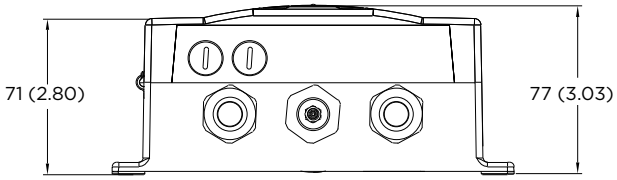
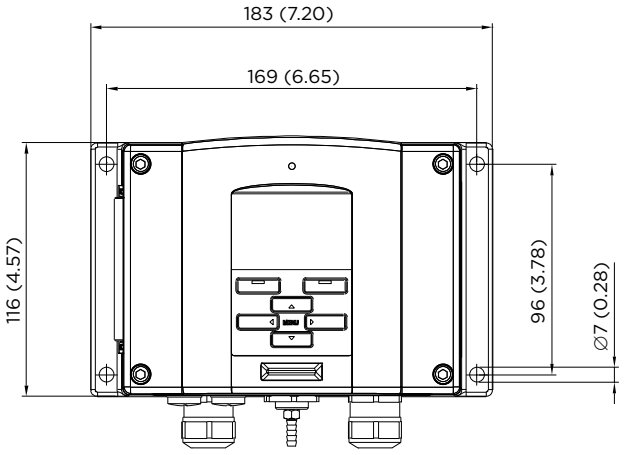
Dimensional Drawings of the PTB330 Digital Barometer

Dimensions

Dimensions in mm (inches)

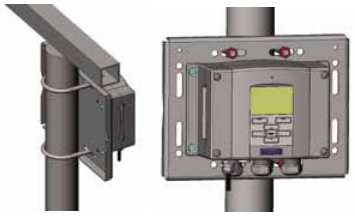




Mounting Options

Mounting with Wall Mounting Kit

Mounting with DIN Rail Installation Kit



Pole Installation with Installation Kit for Pole or Pipeline

Mounting Rain Shield with Installation Kit

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Events

Take the Lab to the Field

Vaisala Barometric Pressure Transfer Standard PTB330TS

Operational PTB330TS unit includes a PTB330 digital barometer, hand-held MI70 indicator, optional HMP155 humidity and temperature probe, optional MI70 Link PC software, a user's guide and a weatherproof transfer case equipped with a shoulder strap.

PTB330TS transport case

Barometric Pressure Transfer Standard PTB330TS makes field inspection accurate and easy. It combines a PTB330 digital barometer with a hand-held MI70 indicator within a portable unit functioning as a transfer standard. The optional HMP155 probe is available for accurate humidity and temperature measurement.

The PTB330TS is suitable for various reference measurements in industrial and meteorological areas.

The PTB330TS comes in a durable and weatherproof transport case that can be easily carried and shipped. The components are placed in a proofing foam interior, with accessories and user's guide placed in the lid organizer. The case includes a separate inner tabletop case in which the barometer is mounted. Shoulder strap is included for convenience. Battery duration is up to 11 hours of continuous use and up to 30 days in data logging use.

Features / Benefits

- Portable, battery operated transfer standard with data logging capability
- Barometric pressure with Vaisala BAROCAP® Digital Barometer PTB330
  - Excellent long term stability
  - Accurate measurements
  - Added reliability through redundancy
- Optional humidity and temperature measurements with HMP155
  - Vaisala HUMICAP®180R sensor - superior long-term stability
  - New, fast temperature probe
  - Chemical purge
- Multilingual user interface, nine languages
- Data can be logged, and transferred to a PC via MI70 Link software
- SO/IEC 17025 Accredited calibration services available
- For professional meteorology, aviation, laboratories and demanding industrial applications

The PTB330 Digital Barometer

The HMP155 probe

The MI70 hand-held indicator displaying the prevailing pressure in hPa

PTB330 Digital Barometer

Vaisala BAROCAP® Digital Barometer PTB330 is a new generation barometer designed for a wide range of high-end atmospheric pressure measurement. The pressure measurement of the PTB330 is based on the Vaisala in-house, silicon capacitive, absolute pressure sensor – the Vaisala BAROCAP® Sensor. It provides high measurement accuracy and excellent long-term stability.

High Accuracy

The PTB330 series features extremely high accuracy. Class A barometers for the most demanding applications are fine-adjusted and calibrated against a high-precision pressure calibrator. All the PTB330 barometers come with a NIST traceable, factory calibration certificate, also optional ISO/IEC 17025 accreditation calibration services are available.

Reliability through Redundancy

According to customers' choice, the PTB330 can incorporate one, two or three BAROCAP® sensors. When two or three sensors are used, the barometer continuously compares the readings of the pressure sensors against one another and provides information on whether these are within the set internal difference criteria. This unique feature provides redundancy in pressure measurement. Thus, users get a stable and reliable pressure reading at all times as well as a pre-indication of when to service or re-calibrate the barometer.

Optional HMP155 Humidity and Temperature Probe

The new Vaisala HUMICAP® Humidity and Temperature Probe HMP155 provides reliable humidity and temperature measurement.

Long-Term Stability

The HMP155 has a new generation Vaisala HUMICAP®180R sensor that has excellent stability and withstands harsh environments well. The probe structure is solid and the sensor is protected with a sintered teflon filter, which gives maximum protection against liquid water, dust, and dirt.

Fast Temperature Measurement

What's more, with its fast response time, the additional temperature probe for the HMP155 is ideal for measurement in environments with rapidly changing temperatures.

MI70 Hand-Held Indicator for Spot-Checking Applications

The Vaisala Measurement Indicator MI70 is a user-friendly indicator for demanding spot-checking measurements. It is ideal for field checking and calibration of Vaisala's fixed instruments.

Easy-to-Use User Interface and Three-Variable Display

The MI70 features a multilingual, menu-based user interface, and a clear graphical LCD display. Overall three measurement parameters can be displayed and logged into the meter's memory at the same time. One or two probes or transmitters can be connected simultaneously.

MI70 Link

The optional MI70 Link Windows® software and the USB connection cable form a practical tool for transferring logged data and real time measurement data from the MI70 to a PC.

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Vaisala Barometric Pressure Transfer Standard PTB330TS

Technical Data

These specifications apply when MI70, PTB330 and HMP155 are used together in the PTB330TS product. For individual specifications, please refer to the product documentation and brochures of the PTB330 and HMP155.

General

Operating temperature range	-10 ... +40 °C (+14 ... +104)°F
Operating humidity range	non-condensing
Maximum pressure limit	5000 hPa abs.
Power supply	Rechargeable NiMH battery pack with AC-adapter or 4xAA-size alkalines, type IEC LR6
Operation time (using rechargeable battery pack)	
Continuous use with PTB330	11 h typical at +20 °C (+68 °F)
Datalogging use	up to 30 days
Menu languages	English, Chinese, French, Spanish, German, Russian, Japanese, Swedish, Finnish
Display	LCD with backlight, graphic trend display of any parameter, character height up to 16 mm
Data logging capacity	2700 points
Alarm	audible alarm function

PTB330TS is in conformity with the following EU directives:
- EMC Directive (2004/108/EC) Complies with the EMC product family standard EN61326-1, Electrical equipment for measurement control and laboratory use - Basic immunity test requirements.
- Low Voltage Directive (2006/95/EC)
- ROHS Directive (2002/95/EC)

Performance

Barometric Pressure (PTB330)

Measurement range	500 ... 1100 hPa
Linearity*	±0.05 hPa
Hysteresis*	±0.03 hPa
Repeatability*	±0.03 hPa
Calibration uncertainty**	±0.07 hPa
Accuracy at +20 °C (+68 °F) ***	±0.10 hPa
Temperature dependence****	±0.1 hPa
Total accuracy -40... +60 °C (-40...+140 °F)	±0.15 hPa
Long-term stability	±0.1 hPa/year
Settling time at power-up (one sensor)	4 s
Response time (one sensor)	2 s
Acceleration sensitivity	negligible

* Defined as ±2 standard deviation limits of endpoint nonlinearity, hysteresis or repeatability error.
** Defined as ±2 standard deviation limits of inaccuracy of the working standard including traceability to NIST.
*** Defined as the root sum of the squares (RSS) of endpoint non-linearity, hysteresis error, repeatability error and calibration uncertainty at room temperature.
**** Defined as ±2 standard deviation limits of temperature dependence over the operating temperature range.

Relative Humidity (HMP155)

Measurement range	0 ... 100 %RH
Accuracy (incl. non-linearity, hysteresis and repeatability) at +15 ... +25 °C (+59 ... +77 °F)	
	±1 %RH (0 ... 90 %RH)
	±1.7 %RH (90 ... 100 %RH)
-10 ... +40 °C (-4 ... 104 °F)	±(1.0 + 0.008 x reading) %RH
Factory calibration uncertainty (+20 °C /+68 °F)	
	±0.6 %RH (0 ... 40 %RH)*
	±1.0 %RH (40 ... 97 %RH)*
Humidity sensor	HUMICAP180R
	HUMICAP180RC
Response time at +20 °C in still air with a sintered PTFE filter	
63 %	20 s
90 %	60 s

* Defined as ±2 standard deviation limits. Small variations possible, see also calibration certificate.

Temperature (HMP155)

Measurement range	-10 ... +40 °C (+14 ... +104 °F)
Accuracy	
-10 ... +20 °C	±(0.176 - 0.0028 x temperature) °C
+20 ... +40 °C	±(0.07 + 0.0025 x temperature) °C
Accuracy over temperature range (see graph overleaf)	
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751
Response time with additional temperature probe in 3 m/s air flow	
63 %	<20 s
90 %	<35 s

Technical Data

Available Parameters

Pressure parameters	P, P3h, HCP, QFE, QNH
Humidity and temperature parameters	RH, T, Tdf, Td, x, Tw

Inputs and Outputs

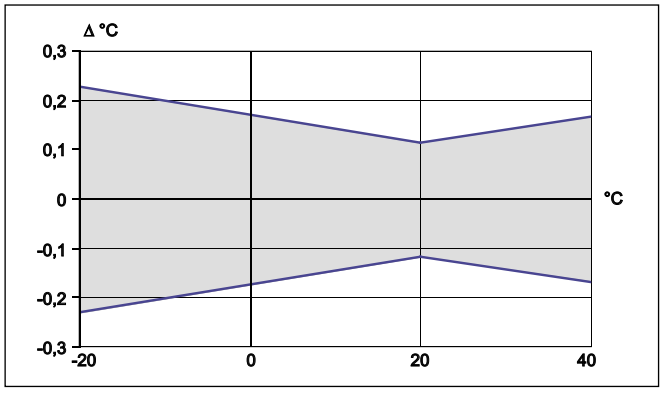
MI70 probe ports	2
MI70 data interface	RS-232 (accessible only with MI70 Link software)
PTB330 supply voltage	10 ... 35 VDC (if not powered by MI70)
PTB330 data interface	RS-232C
PTB330 serial I/O connectors	RJ45 (service port) Male 8-pin M12 (user port)
HMP155 data interface	RS-485
HMP155 serial I/O connector	Male 8-pin M12

Mechanics

PTB330	
Housing material	G-AlSi 10 Mg (DIN 1725)
Housing classification	IP65
Pressure connector	M5 (10-32) internal thread
Pressure fitting	barbed fitting for 1/8" I.D. tubing or quick connector with shutoff valve for 1/8" hose
HMP155	
Housing material	PC
Housing classification	IP66
Additional T-probe cable length	2 m
Cable material	PUR
Sensor protection	Sintered PTFE
MI70 MEASUREMENT INDICATOR	
Housing classification	IP54
Housing material	ABS/PC blend
TRANSPORT CASE	
Housing classification (when closed)	IP67
Plastic parts	TTX01®, PP+SEBS, POM
Metal parts	stainless steel AISI303
Interior foam material	PE and polyether
Weight with all instruments and typical accessories	5.9 kg
Exterior dimensions (LxWxH)	405×330×165 mm (15.94×12.99×6.50) inch

Accessories

PTB330	
MI70 – PTB330 Spiral Cable	223235SP
USB-RJ45 serial connection cable	219685
Serial connection cable	19446ZZ
Barbed fitting 1/8"	19498SP
Quick Connector 1/8"	220186
Transport case with interior foams and tabletop casing for PTB330	224068SP
Tabletop casing for PTB330	224064SP
MI70	
USB cable for MI70, includes MI70 Link software	219687
MI70 Link software	MI70LINK
MI70 connection cable to HMT330, MMT330, DMT340, HMT120/130, HMT100, PTB330	211339
MI70 battery pack	26755
variety of AC adapters available	
HMP155	
HMP155 – MI70 connection cable	221801
Protection set for HMP155 calibration buttons: protective cover, 2 O-rings and protective plug	221318
USB cable for HMP155	221040
Sintered teflon filter + O-ring	219452SP
Humidity sensor	HUMICAP180R
Humidity Calibrator	HMK15



Accuracy of HMP155 temperature measurement over temperature range

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PTB210 Digital Barometer

The Vaisala BAROCAP® Digital Barometer PTB210 is a reliable outdoor barometer that withstands harsh conditions.

The PTB210 paired with the SPH10 Static Pressure Head.

For Harsh Environments

The Vaisala BAROCAP® Digital Barometer PTB210 is ideal for outdoor installations and harsh environments. The barometers are designed to operate in a wide temperature range, and the electronics housing provides IP65 (NEMA 4) standardized protection against sprayed water.

Features/Benefits

- 500 ... 1100 hPa or 50 ... 1100 hPa pressure ranges with serial output
- Different scalings between 500 ... 1100 hPa with analog output
- Electronics housing IP65 protected against sprayed water
- Accurate and stable measurement
- NIST traceable (certificate included)

The PTB210 barometers are ideal for use in applications such as weather stations, data buoys and ships, airports, and agrology. They are also an excellent solution for monitoring barometric pressure in industrial equipment such as laser interferometers and engine test benches.

Several Pressure Ranges

The PTB210 barometers are designed for various pressure ranges. They are available in two basic configurations: serial output for 500 ... 1100 hPa and 50 ... 1100 hPa and analog output with different scalings between 500 ... 1100 hPa.

Accurate and Stable Measurement

All the PTB210 barometers are digitally adjusted and calibrated by using electronic working standards. A higher accuracy barometer, that is fine-tuned and calibrated against a High Precision Pressure Calibrator, is available for the 500 ... 1100 hPa pressure range.

In addition, the PTB210 integrates directly with Vaisala Static Pressure Head Series SPH10/20. This pairing offers accurate measurement in all wind conditions.

Vaisala BAROCAP® Technology

The PTB210 barometers use the Vaisala BAROCAP® Sensor, a silicon capacitive absolute pressure sensor developed by Vaisala for barometric pressure applications. The Vaisala BAROCAP® Sensor provides excellent hysteresis and repeatability characteristics and outstanding temperature and long-term stability. All PTB210 barometers are delivered with a factory calibration certificate which is NIST traceable.

Technical Data

Operating Range (1hPa=1mbar)

Pressure range (order specified)	
serial output	500 ... 1100 hPa
	50 ... 1100 hPa
analog output	500 ... 1100 hPa
	600 ... 1060 hPa
	800 ... 1060 hPa
	900 ... 1100 hPa
Operating temperature range	-40 ... +60 °C (-40 ... +140 °F)
Humidity range	non-condensing

Accuracy

SERIAL OUTPUT (units in hPa)			
Pressure range	500 ... 1100		50 ... 1100
	Class A	Class B	
Non linearity*	± 0.10	± 0.15	± 0.20
Hysteresis*	± 0.05	± 0.05	± 0.10
Repeatability*	± 0.05	± 0.05	± 0.10
Calibration uncertainty**	± 0.07	± 0.15	± 0.20
Accuracy at +20 °C (+68 °F)***	± 0.15	± 0.20	± 0.35
Temperature dependence****	± 0.20	± 0.20	± 0.40
Total accuracy***	± 0.25	± 0.30	± 0.50
-40 ... +60 °C (-40 ... +140 °F)			
Long term stability (hPa/year)	± 0.10	± 0.10	± 0.20

ANALOG OUTPUT	
Non linearity*	± 0.20 hPa
Hysteresis*	± 0.05 hPa
Repeatability*	± 0.05 hPa
Calibration uncertainty**	± 0.15 hPa
Accuracy at +20 °C (+68 °F)***	± 0.30 hPa
Temperature dependence****	± 0.50 hPa
Total accuracy*** -40 ... +60 °C (-40 ... +140 °F)	± 0.60 hPa
Long term stability	± 0.10 hPa/year

* Defined as the ±2 standard deviation limits of end point non-linearity, hysteresis error or repeatability error.
** Defined as ±2 standard deviation limits of inaccuracy of the working standard including traceability to NIST.
*** Defined as the root sum of the squares (RSS) of end point non-linearity, hysteresis error, repeatability error and calibration uncertainty at room temperature.
**** Defined as ±2 standard deviation limits of temperature dependence over the operating temperature range.

General

(· Factory setting)

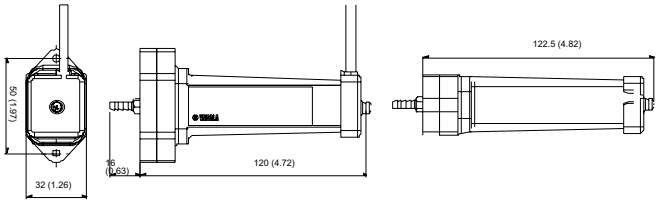
SERIAL OUTPUT	
Current consumption	
normal mode	< 15 mA·
power down mode	< 0.8 mA
shutdown mode	0.2 mA
Shutdown	ON/OFF
Settling time at power up	2 s
Serial I/O (factory setting·)	RS232C
	RS232C /TTL (optional)
	RS485, non isolated (optional)
parity	none, even·, odd
data bits	7·, 8
stop bits	1·, 2
Baud rate	1200, 2400, 4800, 9600·, 19200
Response time	1 s·
Resolution	0.01 hPa (1 measurement/s)
	0.03 hPa (10 measurements/s)

ANALOG OUTPUT	
Outputs	0 ... 5 VDC, 0 ... 2.5 VDC (order specified)
Current consumption	
normal mode	< 8 mA
shutdown mode	0.2 mA
Shutdown	ON/OFF
Response time	500 ms
Resolution	300 µV
Measurement rate	3 measurements/s

ALL MODELS	
Supply voltage (reverse polarity protected)	
with RS232/TTL output	5 ... 28 VDC
with RS485 or analog output	8 ... 18 VDC
Max. pressure	5 000 hPa abs.
Pressure connector	M5 (10-32) internal thread
Pressure fitting	barbed fitting for 1/8" I.D. tubing
Housing	
electronics	IP65 (NEMA 4)
sensor	IP53
Housing material	PC plastic
Supply/output cable length	1, 2, 3, 5 or 10 m
Instrument	110 g
Cable	28 g/m
Electromagnetic compatibility	Complies with EMC standard
	EN61326-1, Generic Environment

Dimensions

Dimensions in mm (inches)



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PTB110 Barometer for Industrial Use

The Vaisala BAROCAP® Barometer PTB110 offers outstanding long-term stability.

Features/Benefits

- Vaisala BAROCAP® sensor
- Several pressure ranges
- Accuracy ±0.3 hPa at +20 °C
- Long-term stability
- On/off control with external trigger
- Output voltage 0 ... 2.5 or 0 ... 5 VDC
- Current consumption less than 4 mA
- Mountable on a (35 mm wide) DIN rail
- NIST traceable (certificate included)

PTB110

The Vaisala BAROCAP® Barometer PTB110 is designed both for accurate barometric pressure measurements at a room temperature and for general environmental pressure monitoring over a wide temperature range.

Vaisala BAROCAP® Technology

The PTB110 barometer uses the Vaisala BAROCAP® Sensor, a silicon capacitive absolute pressure sensor developed by Vaisala for barometric pressure measurement applications.

The sensor combines the outstanding elasticity characteristics and mechanical stability of single-crystal silicon with the proven capacitive detection principle.

Accuracy and Stability

The excellent long-term stability of the barometer minimizes or even removes the need for field adjustment in many applications.

Applications

The PTB110 is suitable for a variety of applications, such as environmental pressure monitoring, data buoys, laser interferometers, and in agriculture and hydrology.

The compact PTB110 is especially ideal for data logger applications as it has low power consumption. Also an external On/Off control is available. This is practical when the supply of electricity is limited.

Technical Data

Operating Range (1 hPa=1mbar)

Pressure ranges	500 ... 1100 hPa
	600 ... 1100 hPa
	800 ... 1100 hPa
	800 ... 1060 hPa
	600 ... 1060 hPa
Temperature range	-40 ... +60 °C (-40 ... +140 °F)
Humidity range	non-condensing

General

Supply voltage	10 ... 30 VDC
Supply voltage control	with TTL level trigger
Supply voltage sensitivity	negligible
Current consumption	less than 4 mA
in shutdown mode	less than 1 µA
Output voltage	0 ... 2.5 VDC
	0 ... 5 VDC
Output frequency	500 ... 1100 Hz
Resolution	0.1 hPa
Load resistance	minimum 10 kohm
Load capacitance	maximum 47 nF
Settling time	1 s to reach full accuracy after power-up
Response time	500 ms to reach full accuracy after a pressure step
Acceleration sensitivity	negligible
Pressure connector	M5 (10-32) internal thread
Pressure fitting	barbed fitting for 1/8"
Minimum pressure limit	0 hPa abs
Maximum pressure limit	2000 hPa abs
Electrical connector	removable connector for 5 wires (AWG 28 ... 16)
Terminals	Pin 1: external triggering
	Pin 2: signal ground
	Pin 3: supply ground
	Pin 4: supply voltage
	Pin 5: signal output
Housing material, plastic cover	ABS/PC blend
Housing classification	IP32
Metal mounting plate	Al
Weight	90 g
Electromagnetic compatibility	Complies with EMC standard EN 61326-1, Electrical equipment for measurement, control and laboratory use - EMC requirements - for use in industrial locations

Accuracy

Linearity*	±0.25 hPa
Hysteresis*	±0.03 hPa
Repeatability*	±0.03 hPa
Pressure calibration uncertainty**	±0.15 hPa
Voltage calibration uncertainty	± 0.7 mV
Frequency calibration uncertainty	± 0.3 Hz
Accuracy at +20 °C***	±0.3 hPa

* Defined as ±2 standard deviation limits of end-point non-linearity, hysteresis error or repeatability error.

** Defined as ±2 standard deviation limits of inaccuracy of the working standard including traceability to NIST.

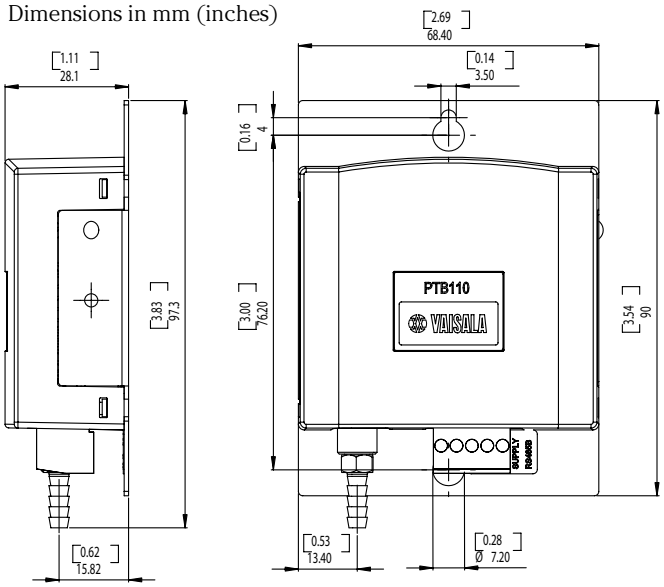
*** Defined as the root sum of the squares (RSS) of end-point non-linearity, hysteresis error, repeatability error and calibration uncertainty at room temperature when using voltage output.

TOTAL ACCURACY AT

+15 ... +25 °C (+59 ... +77 °F)	±0.3 hPa
0 ... +40 °C (+32 ... +104 °F)	±0.6 hPa
-20 ... +45 °C (-4 ... +113 °F)	±1.0 hPa
-40 ... +60 °C (-40 ... +140 °F)	±1.5 hPa
Long-term stability	±0.1 hPa/year

Dimensions

Dimensions in mm (inches)



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SPH10/20 Static Pressure Heads for Minimizing Wind Induced Error

Wind induced effects are one of the main sources of error when measuring barometric pressure. Variations due to strong and gusty wind can be overcome by using a static pressure head to 'filter out' the effect of dynamic pressure.

The Vaisala Static Pressure Head Series SPH10/20 are designed to minimize the errors caused by wind. The wind tunnel tested structure is both horizontally and vertically symmetrical. This design ensures reliable barometric pressure measurements in all weather.

Ideal for Outdoor Installations

Vaisala's static pressure heads are available in two models: the Vaisala Static Pressure Head SPH10 is a basic version, and the Vaisala Static Pressure Head SPH20 is a heated version for reliable operation in snowy and icy conditions. The warmed SPH20 contains a thermostat that switches on the warming power at temperatures, where the risk of icing may occur.

Composed of ultraviolet stabilized PC plastics and offshore aluminium, the SPH10/20 static pressure heads are durable and weather resistant.

The SPH10/20 protects against rain and condensed water, thus preventing capillary condensation of a water column in the pressure channel which results in pressure error. The drain holes in the lower plate allow rain and water to flow out. The static pressure heads have internal netting which prevents insects and debris from blocking the pressure channel.

Carefree Maintenance

The SPH10/20 static pressure heads are easy to install and disassemble, service and clean – even at the installation site. Vaisala BAROCAP® Digital Barometer PTB210 can be installed directly on top of the SPH10/20 static pressure heads. Other barometers can be connected to the heads with pressure tubing.

SPH10 and SPH20 are a perfect pair for all Vaisala barometers. They ensure an accurate and reliable measurement in all weather conditions.

The SPH10/20 is easy to install and connect. In the picture, a SPH10 is connected to a PTB210 barometer.

Features/Benefits

- Minimizes wind induced error
- Reliable barometric pressure measurement in all weather
- Wind tunnel tested structure
- Easy-to-clean
- Easy-to-install

Technical Data

General

Operating temperature	-60 ... +80 °C (-76 ... +176 °F)
Weight	
SPH10	800 g
SPH20	1360 g
Material	PC plastic, offshore aluminium
Mounting	with 2 bolts (M6 X 20 mm min)
Hose connection	barbed fitting for 4 mm I.D. hose or Rp1/4 thread (parallel)

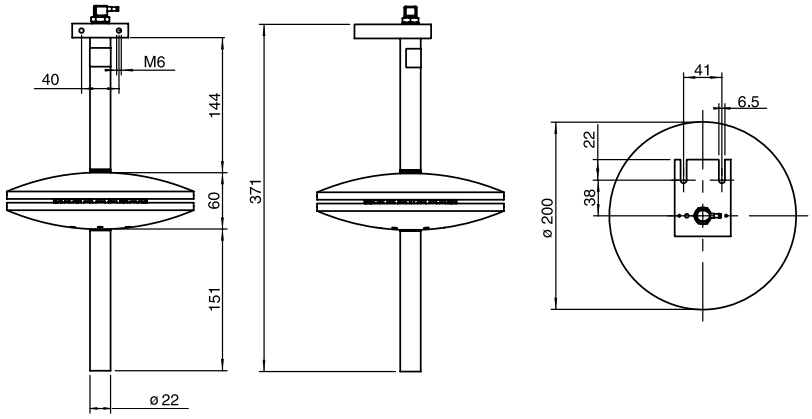
SPH20

Electrical connections	M12 connector
Power supply	factory setting 12 V
	changed connection 24 V
Thermostat switching temperature	
On	+4 °C (±3 °C)
	+39.2 °F (±4.4 °F)
Off	+13 °C (±3 °C)
	+55.4 °F (±4.4 °F)
Power consumption during heating	70 W

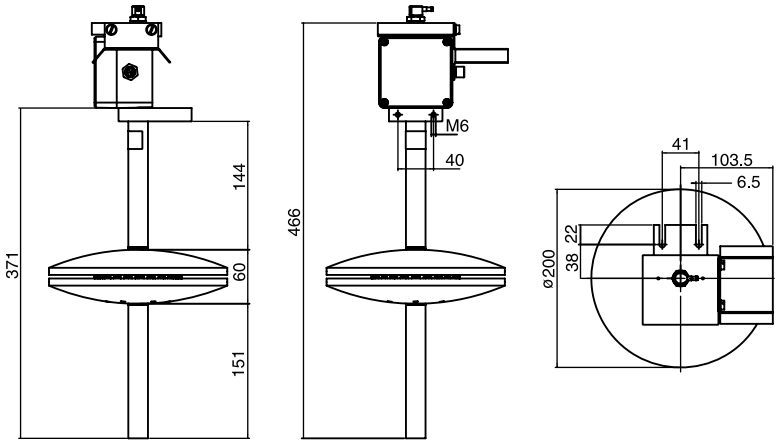
Dimensions

Dimensions in mm

SPH10



SPH20



Pressure

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Vaisala Differential Pressure Transmitter PDT102

Vaisala Differential Pressure Transmitter PDT102 with process valve actuator and test jacks.

Features

- In-place system calibration and on-line monitoring without disturbing process tubes with optional process valve actuator and test jacks
- Ultrathin profile ideally suited for DIN rail mount reduces installation and calibration costs
- High accuracy, two options; 0.25% or 0.50% of span designed for use in critical monitoring of cleanrooms for pharmaceutical, biotechnology, medical device and semiconductor controlled manufacturing environments
- Extremely robust MEMS silicon sensor technology provides very high accuracy, sensitivity, stability and durability
- NIST traceable 9 point calibration with certificate
- Front side accessible zero and span adjustment potentiometers

Operating Environment

Vaisala Differential Pressure Transmitter PDT102 is a high performance instrument designed primarily for life science and high technology cleanroom applications. The front panel includes zero and span adjustment potentiometers for convenient adjustment. The PDT102 transmitter is ideal for incorporating into the Vaisala Veriteq Continuous Monitoring System to measure and monitor the critical environmental parameters as required in regulated environments.

Performance

The PDT102 offers very high accuracy, sensitivity and stability with two options for accuracy, 0.25% or 0.50% of span providing a highly reliable and repeatable measurement. The sensor uses a micro-machined, ultra-thin silicon diaphragm which provides inherent sensor repeatability and stability. The sensor enables precise measurement and control in high performance cleanrooms. The PDT102 transmitter is available with voltage output (3-wire) or current output (2-wire).

Available Options

Online monitoring of the PDT102 is simple using the optional process valve actuator and the front access test jacks. The front access test jacks provide online process reference signal or calibration signal without disconnecting power supply wiring. Measurements can be made using a standard multimeter.

Technical Data

Performance

Measurement ranges (bidirectional)	±50 Pa ±0.25 in H_2O
Overpressure	
proof pressure	0.7 bar
burst pressure	1.7 bar
static pressure	1.7 bar
Pressure type	differential, gauge, vacuum and compound
Accuracy (incl. non-linearity, hysteresis, repeatability and zero/span calibration settings)	0.25 % span or 0.5 % span, depending on choice
Repeatability	
for 0.25 % span accuracy	0.03 %
for 0.5 % span accuracy	0.05 %
Electrical resolution	1 x 10^{-4} span
Long-term stability	≤0.5 % span/year
Response time (10 ... 90 %)	250 ms
Warm-up time	15 s
Compensated temperature range	+2 ... +57 °C (+35.6 ... +134.6 °F)
Temperature dependence	±(0.036 Pa + 0.036 % of reading) / °C or ±(0.0001 in H_2O + 0.02% of reading) /°F (reference 21 °C or 70 °F)
Mounting position error (zero adjustable)	≤0.25 %
Adjustments (front accessible)	
zero	±5 % span
span	±3 % span

Operating Environment

Operating temperature	-29 ... +70 °C (-20.2 ... +158 °F)
Storage temperature	-40 ... +82 °C (-40 ... +179.6 °F)
Electromagnetic compatibility (EN 61326-1), basic immunity test requirements	

Note: If used in an electromagnetic field of 3 V/m, with narrow frequency area of 80 - 120 Mhz, it is possible that the current output of PDT102 can deviate max. 0.3% (with accuracy specified 0.25%).

Inputs and Outputs

Process connection	1/8 NPT female according to ANSI/ASME B1.20.1
Output signal	
2-wire	4 ... 20 mA
3-wire	0 ... 5 V
Operating voltage	12 ... 36 VDC
Max. loop resistance for 4 ... 20 mA	≤ (Supply voltage - 12V)/0.022 A
Supply current	
for 0 ... 5 V output	max. 10 mA
for 4 ... 20 mA output	max. 20 mA
Electrical connection	Screw terminals, 12 ... 22 AWG (0.33 up to 3.31 mm^2)

Mechanics

Medium (measured gas)	clean and dry air, non-conducting and non-corrosive gases
Material	
process connection	brass
sensor element	silicon, aluminium, glass
case	Polycarbonate, glass filled (UL94-V-1)
Mounting	DIN rail types EN 50022, EN 50035 and EN 50045
Housing classification	IP30
Weight	0.16 kg

Dimensions

Dimensions in mm

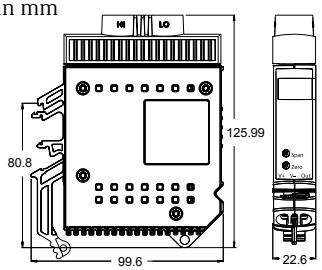

Figure 1

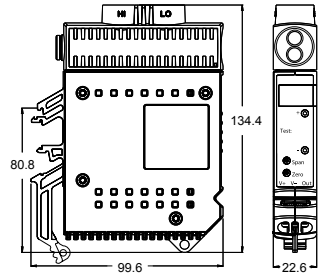

Figure 2 with Process Valve Actuator and Test Jacks

Order Information for PDT102

PDT102 - XXXT

Measurement range:
P (+/-50 Pa) or **W** (+/-0.25 in H_2O)

Accuracy: **2** (0.25 % span) or **5** (0.5 % span)

Output: **C** (current) or **V** (voltage)

Option: (blank) or **T**

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Vaisala Differential Pressure Transmitter PDT101

Vaisala Differential Pressure Transmitter PDT101 with current output (black) and voltage output (green).

Features

- Easy mounting on wall, DIN rail or panel
- 2 pressure ranges (Pa and in H_2O)
- Accessible zero and span adjustment potentiometers
- ¼" brass tubing connections
- LED status indicator
- Specially designed for critical and regulated environments
- Euro style detachable connector
- NIST traceable (certificate included)

Operating Environment

Vaisala Differential Pressure Transmitter PDT101 is designed especially for demanding life science and high technology cleanroom applications. The PDT101 transmitter is ideal for incorporating into the Vaisala Veriteq Continuous Monitoring System to measure and monitor the critical environmental parameters as required in regulated environments.

Performance

The PDT101 offers high accuracy, sensitivity and stability with accuracy 0.40% of span providing a highly reliable and repeatable measurement. The sensor uses a micro-machined, ultra-thin silicon diaphragm which provides inherent sensor repeatability and stability. The sensor enables precise measurement and control in high performance cleanrooms. The PDT101 transmitter is available with voltage output (3-wire) or current output (2-wire).

Zero and span adjustment screws are available on every PDT101 model. Both adjustments are accessible from the front of the unit.

Applications

The PDT101 is suitable for high performance cleanroom environments in the life science, semiconductor and electronics industries. As part of a continuous monitoring system, it is highly suitable for regulated environments where continuous, documented and redundant data is a requirement to meet FDA regulations. The compact design is well suited for mounting in a cleanroom or in the adjacent corridor with LED indicator lights for quick and easy power status spotcheck.

Technical Data

Performance

Measurement ranges (bidirectional)	±60 Pa ±0.25 in H_2O
Overpressure	
proof pressure	1.0 bar
burst pressure	1.7 bar
static pressure	1.7 bar
Pressure type	differential, gauge, vacuum and compound
Accuracy (incl. non-linearity, hysteresis, repeatability and zero/span calibration settings)	0.4 % span
Long-term stability	≤0.5 % span/year
Response time (10 ... 90 %)	250 ms
Warm-up time	15 s
Compensated temperature range	+2 ... +54 °C (+35.6 ... +129.2 °F)
Temperature dependence	±(0.065 Pa + 0.054 % of reading) / °C or ±(0.00015 in H_2O + 0.03 % of reading) / °F (reference 21 °C or 70 °F)
Mounting position error (zero adjustable)	≤1 %/g (calibration in vertical position is standard)
Adjustments (front accessible)	
zero	±5 % span
span	±3 % span

Operating Environment

Operating temperature	-18 ... +70 °C (-0.4 ... +158 °F)
Storage temperature	-40 ... +82 °C (-40 ... +179.6 °F)
Electromagnetic compatibility (EN 61326-1), basic immunity test requirements	

Note: If used in an electromagnetic field of 3 V/m, with narrow frequency area of 80 - 120 Mhz, it is possible that the current output of PDT101 can deviate max. 0.8% (with accuracy specified 0.4%).

Inputs and Outputs

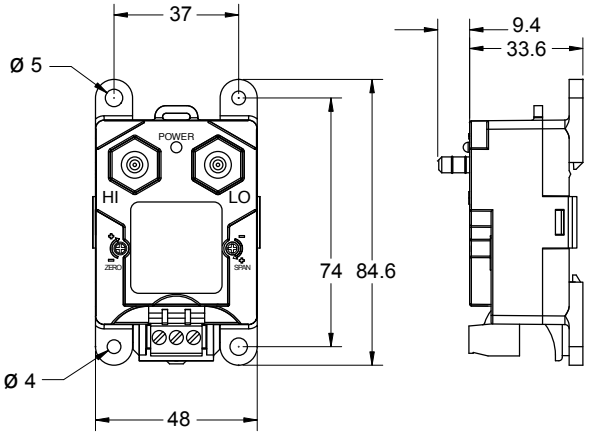
Process connection	1/4" barbed fittings
Output signal	
2-wire	4 ... 20 mA
3-wire	0 ... 5 VDC (user selectable 0 ... 10 VDC)
Operating voltage	
2-wire output 4 ... 20 mA	12 ... 36 VDC
3-wire output 0 ... 5 VDC	11.5 ... 36 VDC
3-wire output 0 ... 10 VDC	14 ... 36 VDC or 24 VAC
Max. loop resistance for 4 ... 20 mA	≤ (Supply voltage - 12V)/0.022 A
Supply current	max. 20 mA for 4 ... 20 mA output signal
Optical process diagnostics	LED visual indicator
Electrical connection	Euro style pluggable terminal block accepts 12...26 AWG wire (0.13 up to 3.31 mm^2)

Mechanics

Medium (measured gas)	clean and dry air, non-conducting and non-corrosive gases
Material	
process connection	brass
sensor element	silicon, aluminium, glass
case	NEMA type 1 fire-retardant ABS 1 (meets UL94-5VA)
Mounting	threaded fastener for wall mounting or DIN rail type EN50022
Housing classification	IP40
Weight	0.07 kg

Dimensions

Dimensions in mm



Order Information for PDT101

PDT101 - XXX

Measurement range: **P** (+/-60 Pa) or **W** (+/-0.25 in H_2O)

Accuracy: **4** (0.4 % span)

Output: **C** (current) or **V** (voltage)

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VAISALA / TECHNOLOGY DESCRIPTION

Vaisala Wind and Weather Sensor Technologies for Measurements in Industrial Applications

Vaisala's long history in wind and weather measurements started already in the 1930s from the development of a radiosonde to measure the conditions in the upper atmosphere. Today, Vaisala wind and weather instruments are used in dozens of applications and industries all over the world.

Industrial Applications for Wind and Weather Measurements

Wind and weather data are required in many activities across industries. For example, in power industry, the efficiency of power lines is a function of wind speed and direction.

Nuclear power plants require wind data for safety reasons to be able to model the dispersion of potentially radioactive leakages. In addition to nuclear power plants, also chemical factories need to gather wind data for dispersion monitoring.

Accurate outdoor measurements are essential in operating modern buildings. Processes such as free cooling, natural ventilation, and automated shading are dependent on real-time weather data. Ventilation control in greenhouses also relies on localized weather data to ensure an optimized environment for plant growth.

Vaisala Wind and Weather Instruments

Vaisala manufactures wind and weather instruments for different applications, requirements and budgets. The wind sensor portfolio for industrial applications includes both mechanical and ultrasonic sensors. View the complete range of wind products at **www.vaisala.com/wind**. Have a look at the multiparameter Vaisala Weather Transmitter WXT520 at **www.vaisala.com/wxt520**.

Vaisala Ultrasonic Wind Sensors in Brief

- Wind sensor with no moving parts
- Unique triangular design for accurate measurements from all directions
- Optional sensor heating available
- Maintance free, no field calibration required
- Measurement range up to 75 m/s

Vaisala Mechanical Wind Sensors in Brief

- Accurate wind speed and direction sensors
- Fast and linear response
- Low measurement starting treshold
- Sensors with heating elements available for cold climates

Vaisala Weather Sensor in Brief

- Measurement of the six essential weather parameters: wind speed and direction, liquid precipitation, barometric pressure, temperature, and relative humidity
- Feature proprietary Vaisala sensor technologies: WINDCAP®, RAINCAP®, HUMICAP®, and BAROCAP®

Vaisala Sensor Technologies for Wind and Rain Measurements

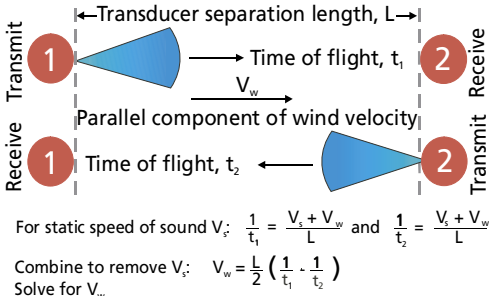
Vaisala WINDCAP® Sensor

Vaisala WINDCAP® Ultrasonic Wind Sensor uses ultrasound to determine wind speed and direction. The sensor has no moving parts, which makes it independent of the limitations of mechanical wind sensors such as friction, inertia, time constant, over-speeding, and starting treshold.

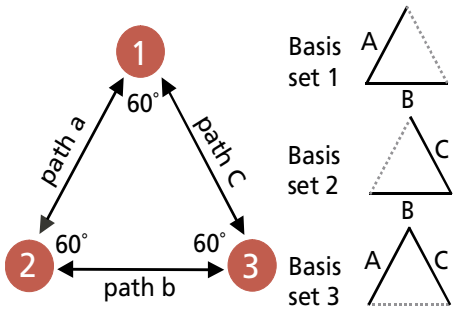
How It Works

WINDCAP® sensor features an array of three ultrasonic transducers oriented to form an equilateral triangle. Wind measurement is based on time of flight (TOF) of the sonic impulse - the time it takes for the signal to travel from one transducer to another. TOF is measured in both directions for each pair of transducer heads. Simple algebra allows solving for the parallel component of wind velocity independently of the static speed of sound.

The equilateral triangle configuration of the three



transducers provides three possible sets of basis vectors. The combinations yield bi-directional measurements on the paths labeled A, B and C. These measurements are used to determine the wind velocity components parallel to each of the three paths.



Vaisala RAINCAP® Sensor

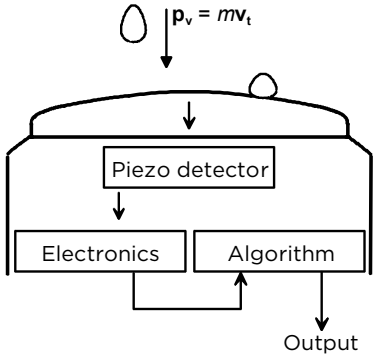
Vaisala RAINCAP® Sensor is an acoustic sensor that measures the impact of individual raindrops on a smooth stainless steel surface using a piezoelectric detector. The sensor provides real time information on rain intensity, duration, and accumulated rainfall.

How It Works

The RAINCAP® sensor consists of a round stainless steel cover, approximately 90 mm in diameter mounted to a rigid frame. A piezoelectric detector is located beneath the cover.

Raindrops hit the RAINCAP® sensor surface at terminal velocity, which is a function of the raindrop diameter. Rain measurement is based on acoustic detection of each individual rain drop as it impacts the sensor cover. Larger drops create a larger acoustic signal than smaller drops.

The piezoelectric detector converts the acoustic signals into voltages. Total rain is calculated from the sum of the individual voltage signals per unit time and the known surface area of the RAINCAP® sensor. In addition, the intensity and duration of rain can be calculated.



Pv = vertical momentum
m = mass of drop
v_t = terminal velocity of drop

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Vaisala Weather Transmitter WXT520
Access to Real Time Weather Data

The WXT520 has an automatic control circuit that switches the heating on at low temperatures.

Features/Benefits

- Measures 6 most essential weather parameters
- Applications: weather stations, dense networks, harbors, marinas
- Low power consumption – works also with solar panels
- Compact, light-weight
- Easy to install with one-bolt mounting method
- No moving parts
- Heating available
- Vaisala Configuration Tool for pc
- USB connection
- IP66 housing with mounting kit

WXT520

The Vaisala Weather Transmitter WXT520 measures barometric pressure, humidity, precipitation, temperature, and wind speed and direction.

To measure wind speed and direction, the WXT520 has the Vaisala WINDCAP® Sensor that uses ultrasound to determine horizontal wind speed and direction.
The array of three equally spaced transducers on a horizontal plane is a Vaisala specific design. Barometric pressure, temperature, and humidity measurements are combined in the PTU module using capacitive measurement for each parameter.
It is easy to change the module without any contact with the sensors.

The WXT520 is immune to flooding clogging, wetting, and evaporation losses in the rain measurement.

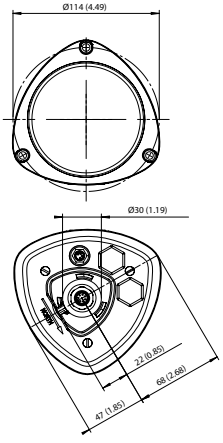
Measuring Acoustic Precipitation

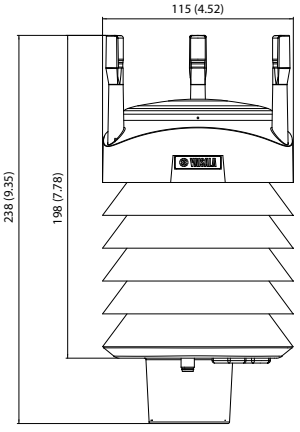
The WXT520 precipitation measurement is based on the unique Vaisala RAINCAP® Sensor, which detects the impact of individual rain drops. The signals exerting from the impacts are proportional to the volume of the drops.
Hence, the signal from each drop can be converted directly to the accumulated rainfall.

The WXT520 measures accumulated rainfall, rain intensity and duration of the rain – all in real time.

Dimensions

Dimensions in mm (inches)





Technical Data

Wind

SPEED	
range	0 ... 60 m/s
response time	250 ms
accuracy	±3% at 10m/s
output resolutions and units	0.1 m/s, 0.1km/h, 0.1 mph, 0.1 knots
DIRECTION	
azimuth	0 ... 360°
response time	250 ms
accuracy	±3°
output resolution and unit	1°

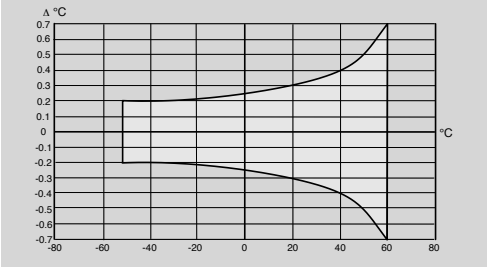
Liquid Precipitation

RAINFALL	cumulative accumulation after the latest automatic or manual reset
output resolutions and units	0.01 mm, 0.001 inches
accuracy	5%*
RAINFALL DURATION	counting each ten-second increment whenever water droplet is detected
output resolution and unit	10 s
RAIN INTENSITY	one-minute running average in ten-second steps
range	0 ... 200 mm/h (broader range with reduced accuracy)
output resolutions and units	0.1 mm/h, 0.01 inches/h
HAIL	cumulative amount of hits against the collecting surface
output resolutions and units	0.1 hits/cm^2, 0.01 hits/in^2, 1 hits
HAIL DURATION	counting each ten-second increment whenever hailstone is detected
output resolution and unit	10 s
HAIL INTENSITY	one-minute running average in ten-second steps
output resolutions and units	0.1 hits/cm^{2}h, 1 hits/in^{2}h, 1 hits/h

* Due to the nature of the phenomenon, deviations caused by spatial variations may exist in precipitation readings, especially in a short time scale. The accuracy specification does not include possible wind induced errors.

Air Temperature

Range	-52 ... +60 °C (-60 ... +140 °F)
Accuracy for sensor at +20 °C	±0.3 °C (±0.5 °F)
Accuracy over temperature range (see graph below)	



Output resolutions and units	0.1 °C, 0.1 °F

Barometric Pressure

Range	600 ... 1100 hPa
Accuracy	±0.5 hPa at 0 ... +30 °C (+32 ... +86 °F)
	±1 hPa at -52 ... +60 °C (-60 ... +140 °F)
Output resolutions and units	0.1 hPa, 10 Pa, 0.0001 bar, 0.1 mmHg, 0.01 inHg

Relative Humidity

Range	0 ... 100 %RH
Accuracy	±3 %RH within 0 ... 90 %RH
	±5 %RH within 90 ... 100 %RH
Output resolution and unit	0.1 %RH

General

Operating temperature	-52 ... +60 °C (-60 ... +140 °F)
Storage temperature	-60 ... +70 °C (-76 ... +158 °F)
Operating voltage	5 ... 32 VDC
Typical power consumption	3 mA at 12 VDC (with defaults)
Heating voltage	5 ... 32 VDC / 5 ... 30 VAC_{RMS})
Serial data interface	SDI-12, RS-232, RS-485, RS-422, USB connection,
Weight	650 g (1.43 lb)
Housing	IP65
Housing with mounting kit	IP66

Electromagnetic Compatibility

Complies with EMC standard EN61326-1; Industrial Environment	
IEC standards	IEC 60945/61000-4-2 ... 61000-4-6

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WMT52 Ultrasonic Wind Sensor

The Vaisala WINDCAP® Ultrasonic Wind Sensor WMT52.

Features/Benefits

- Measures horizontal wind speed and wind direction
- Triangular design ensures excellent data availability
- No moving parts
- Maintenance-free
- Optional heating available
- Compact, durable and robust
- Low power consumption
- IP66 housing with mounting kit
- Applications: marine, wind energy, environmental monitoring

Proven Vaisala Performance

The Vaisala WINDCAP® Ultrasonic Wind Sensor WMT52 incorporates decades of Vaisala experience in wind measurement using ultrasound to determine horizontal wind speed and direction.

With no moving parts, the WMT52 has high sensitivity as the measurement time constant and starting threshold are virtually zero. This makes it superior to the conventional mechanical wind sensors.

The WMT52 is designed to operate without periodic field calibration and maintenance.

Applications

The WMT52 is ideal for use in marine applications as the housing with the mounting kit is water resistant. The WMT52 is also suitable for wind energy and environmental monitoring, for example, for measuring the distribution of air pollution and road tunnel ventilation.

Easy to Install

The WMT52 is delivered fully assembled and configured from the factory. With the Vaisala Configuration Software Tool you can change the settings, such as averaging times, output mode, update intervals, measured variables and message contents.

The WMT52 can be mounted either on top of a pole mast or on a cross arm.

When using the optional mounting kit, the north alignment needs to be performed only once.

Heating

The optional heating available in the WMT52 assists measurements in the freezing weather conditions and during snowfall.

As the heating circuit is independent of the operational power, separate supplies can be used. Heating is switched on automatically at low temperatures, well before the freezing point.

Low Power Consumption

The WMT52 has very low power consumption; during the idle mode the device typically consumes about 2 ... 3 mW.

Technical Data

Wind

WIND SPEED	
Range	0 ... 60 m/s
Response time	250 ms
Available variables	average, maximum, and minimum
Accuracy	±3% at 10m/s
Output resolution	0.1 m/s (km/h, mph, knots)
WIND DIRECTION	
Azimuth	0 ... 360°
Response time	250 ms
Available variables	average, maximum, and minimum
Accuracy	±3°
Output resolution	1°
MEASUREMENT FRAME	
Averaging time	1 ... 3600 s (=60 min), at one second steps on the basis of samples taken at 4 Hz rate (configurable)
Update interval	1 ... 3600 s (=60 min), at one-second steps

General

Self-diagnostics	separate supervision message, unit/status fields to validate measurement quality
Start-up	automatic, <10 s from power on to the first valid output
Serial data interface	SDI-12, RS-232, RS-485, RS-422, USB connection
Communication protocols	SDI-12 v1.3, ASCII automatic & polled, NMEA 0183 v. 3.0 with query option
Baud rate	1200 ... 115 200
Operating temperature	-52 ... +60 °C (-60 ... +140 °F)
Storage temperature	-60 ... +70 °C (-76 ... +158 °F)
Dimensions	
height	139 mm (5.7")
diameter	114 mm (4.49")
weight	510 g (1.12 lb)
Housing	IP65
Housing with mounting kit	IP66
Vibration	IEC 60945 paragraph 8

Power Supply

Operating voltage	5 ... 32 VDC
Power consumption on average	
minimum	0.1 mA at 12 VDC
maximum	14 mA at 5 VDC
typical	3 mA at 12 VDC (default measuring intervals)
Heating voltage	5 ... 32 VDC / 5 ... 30 VAC_{RMS})

Accessories

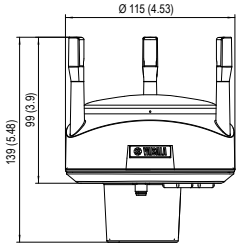
Mounting kit	212792
Bird spike kit	212793
Surge protector for sensor	WSP150

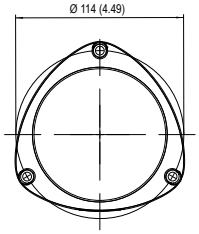
Electromagnetic Compatibility

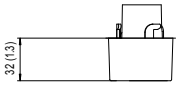
Complies with EMC standard: EN61326-1, Industrial Environment	
IEC standards	IEC 60945/61000-4-2 ... 61000-4-6

Dimensions

Dimensions in mm (inches)







mounting kit

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WA15 Wind Set for High Performance Wind Measurement

The WA15 is based on accurate sensors installed on a large crossarm. It is designed for demanding wind measurement applications.

With a proven track record of successful installations, the Vaisala Wind Set WA15 has earned its reputation as the industry standard in the wind sensor market.

The WA15 consists of a Vaisala Anemometer WAA151, a Vaisala Wind Vane WAV151, an optional crossarm, a power supply and cabling.

Anemometer with Excellent Linearity

The WAA151 is a fast response, low-threshold anemometer. Three lightweight, conical cups mounted on the cup wheel, provide excellent linearity over the entire operating range, up to 75 m/s.

A wind-rotated chopper disc attached to the shaft of the cup wheel cuts an infrared light beam 14 times per revolution. This generates a pulse output from the phototransistor.

Features/Benefits

- High-performance wind measurement set
- Long and successful track record in meteorological applications
- Accurate wind speed and direction measurement
- Low measurement starting threshold
- Conical anemometer cups provide excellent linearity
- Heated shaft prevents bearings from freezing

The output pulse rate is directly proportional to wind speed (e.g. 246 Hz = 24.6 m/s). However, for the highest accuracy, the characteristic transfer function should be used to compensate for starting inertia.

Sensitive Wind Vane

The WAV151 is a counter-balanced, low-threshold, optoelectronic wind vane. Infrared LEDs and phototransistors are mounted on six orbits on each side of a 6-bit GRAY-coded disc. Turned by the vane, the disc creates changes in the code received by the phototransistors. The output code resolution is ±2.8°.

Heated Bearings Withstand Cold Weather

Heating elements in the shaft tunnels of both the anemometer and vane keep the bearings above freezing in cold climates.

Complete Package Available

The anemometer and vane are designed to be mounted on Vaisala crossarms.

The WHP151 power supply provides the operating and heating power needed for the WA15. The power supply, as well as the signal and power cables are available as options.

Technical Data

Vaisala Wind Set WA15

Options and Accessories

Crossarm and termination box	WAC151
16-lead signal cable	ZZ45048
6-lead power cable	ZZ45049
Crossarm and analog transmitter	WAT12
6-lead cable for signal and power	ZZ45049
Crossarm and serial RS485 transmitter	WAC155
Serial RS485 transmitter card	WAC155CB
Power supply	WHP151
Set of bearings and gasket	16644WA
Dimensions	
Junction box	125 x 80 x 57 mm
Crossarm length	800 mm
Mounting to a pole mast with a nominal outside diameter	60 mm
Cup assembly	7150WA
Tail assembly	6389WA

Technical Data

Vaisala Anemometer WAA151

Wind Speed

Measurement range	0.4 ... 75 m/s
Starting threshold	< 0.5 m/s *
Distance constant	2.0 m
Characteristic transfer function	U = 0.328 + 0.101 × R
(where U = wind speed [m/s], R = output pulse rate [Hz])	
Accuracy (within range 0.4 ... 60 m/s)	
with characteristic transfer function	± 0.17 m/s **
with transfer function U = 0.1 × R	± 0.5 m/s***

General

Operating power supply	U_{in} = 9.5 ... 15.5 VDC, 20 mA typical
Heating power supply	AC or DC 20 V, 500 mA nominal
Output	0 ... 750 Hz square wave
Transducer output level	
with I_{out} < +5 mA	high state > U_{in}-1.5 V
with I_{out} > –5 mA	low state < 2.0 V
Settling time after power turn-on	< 30 µs
Plug 6-PIN	MIL-C-26482 type
Cabling	6-wire cable through crossarm
Recommended connector at cable end	SOURIAU MS3116F10-6P
Operating temperature with heating	-50 ... +55 °C (-58 ... +131 °F)
Storage temperature	-60 ... +70 °C (-76 ... +158 °F)
Material	
housing	AlMgSi, grey anodized
cups	PA, reinforced with carbon fibre
Dimensions	240 (h) × 90 (Ø) mm
Swept radius of cup wheel	91 mm
Weight	570 g

Test Compliance

Wind tunnel tests	ASTM standard method D5096-90
Exploratory vibration test	MIL-STD-167-1
Humidity test	MIL-STD-810E, Method 507.3
Salt fog test	MIL-STD-810E, Method 509.3

Complies with EMC standard EN61326-1:1997 + Am1:1998 + Am2:2001; Generic Environment

* Measured with cup wheel in position least favoured by flow direction. Optimum position gives approx. 0.35 m/s threshold.

** Standard Deviation

*** Typical error vs. speed with the "simple transfer function" used.

RANGE (m/s)	0-3	3-10	10-17	17-24	24-31	31-37	37-44	44-51	51-58	58-65
ERROR (m/s)	-0.4	-0.3	-0.2	-0.1	0.0	+0.1	+0.2	+0.3	+0.4	+0.5

Vaisala Wind Vane WAV151

Wind Direction

Measurement range at wind speed 0.4 ... 75 m/s	0 ... 360°
Starting threshold	<0.4 m/s
Resolution	±2.8°
Damping ratio	0.19
Overshoot ratio	0.55
Delay distance	0.4 m
Accuracy	better than ±3°

General

Operating power supply	U_{in} = 9.5 ... 15.5 VDC, 20 mA typical
Heating power supply	AC or DC 20 V, 500 mA nominal
Output code	6-bit parallel GRAY
Output levels	
With I_{out} < +5 mA	high state > U_{in} –1.5 V
With I_{out} > –5 mA	low state < 1.5 V
Settling time after power turn-on	< 100 µs
Plug 10-PIN	MIL-C-26482 type
Cabling	10-wire cable through crossarm
Recommended connector at cable end	SOURIAU MS3116F12-10P
Operating temperature with heating	-50 ... +55 °C (-58 ... +131 °F)
Storage temperature	-60 ... +70 °C (-76 ... +158 °F)
Material	
housing	AlMgSi, grey anodized
wave	Alsi 12 anodized
Dimensions	300 (h) × 90 (Ø) mm
Swept radius of vane	172 mm
Weight	660 g

Test Compliance

Wind tunnel tests	ASTM standard method D5366-93
(for starting threshold, distance constant, transfer function)	
Exploratory vibration test	MIL-STD-167-1
Humidity test	MIL-STD-810E, Method 507.3
Salt fog test	MIL-STD-810E, Method 509.3

Complies with EMC standard EN61326-1:1997 + Am1:1998; Am2:2001; Generic Environment

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Confidence on Day 1, Confidence for Years

Calibration Maintains Reliability

Regular calibration ensures your high-precision instruments continue to provide accurate, high-quality data. Choosing the right calibration laboratory can be as important for lifetime accuracy and reliability as the initial selection of the instrument. Identifying and setting calibration intervals are based on the appliction, product usage and the company's quality system. Our experts are ready to help with these important criteria.

Over 50 Years of Expertise Working for You

Our high-performance calibration laboratories started in 1958 and we continually improve our technology, facilities and capabilities to provide the high quality and scope of services that you expect from Vaisala.

Calibration Services to Meet Your Needs

Our regional Calibration Service Centers are ready with answers, options and flexibility to meet your requirements and budget.

Scope of calibration includes temperature, relative humidity, dew point, barometric pressure, carbon dioxide, and DC voltage and current.

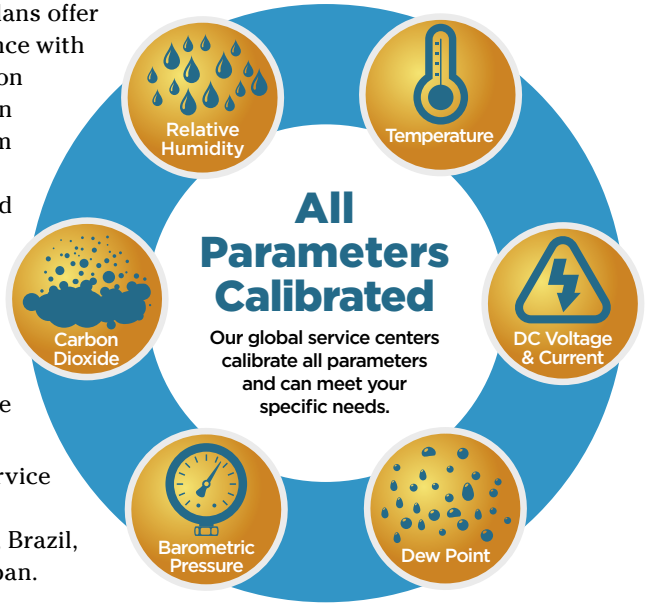
Standard calibrations are traceable to national or international standards and meet ISO9001 quality management standards. Calibration services in our laboratories in the U.S. and Canada also meet ANSI/NSCL Z540.1 requirements.

Other manufacturer's products can also be calibrated at our Service Centers. Contact us with your specific needs.

Pre-paid calibration plans offer savings and convenience with discounts on calibration services, no changes in pricing during the term of the plan, and no purchase order needed for every calibration.

Custom calibration plans are available for customers with unique calibration needs or a high volume of calibrations.

Vaisala Calibration Service Centers are located in Canada, United States, Brazil, Finland, China and Japan.



Accredited Calibrations

Accredited calibrations can be required by regulating bodies or to comply with a company's quality standards. For example, accredited calibration may be required for instruments used as reference standards or to meet various demands from different authorities. Accredited calibrations are available for selected parameters. Calibrations are traceable to national or international standards. Calibration certificates are issued in compliance with the requirements of the ISO/IEC 17025 and are recognized by all the major international accreditation organizations.

Preventive Maintenance

Both product lifespan and uptime can be improved with regular preventive maintenance, decreasing the need for unforeseen repairs and spare parts while lowering life cycle costs and ensuring the continual supply of high-quality data.

Maintenance is carried out by our qualified technicians. All maintenance tasks and schedules will be made to suit your needs and minimize any possible downtime. Preventive maintenance service requires a service agreement.

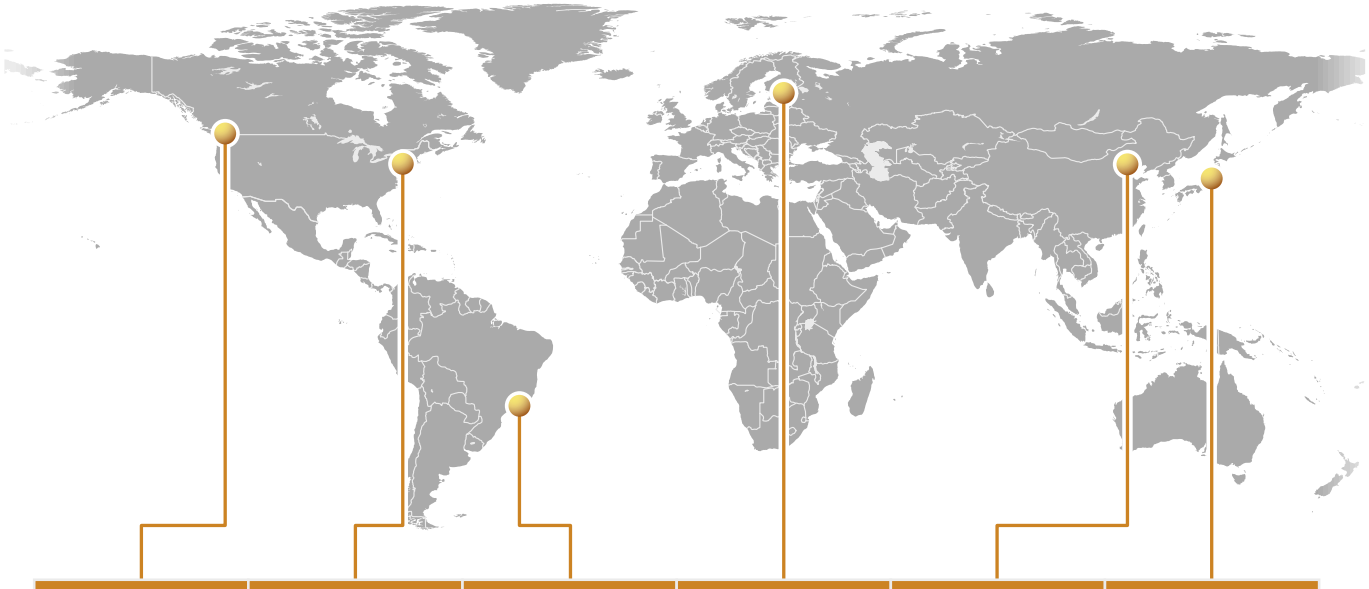
Repair Services

Our professional repair services help extend the life of your Vaisala equipment. We will repair your equipment at the most convenient location – either at your premises or at one of our Regional Service Centers. Repairs include fault tracing and repair or replacement of failed components, as well as final testing to ensure your equipment is functioning according to specifications.

If your equipment requires repair, please first contact our technical support for instructions on how to return products for repair.

Calibration Maintains and Documents Accuracy

Vaisala offers both standard service center calibrations and calibration services that have been accredited by the world's leading accreditation authorities. Accrediting bodies audit management, quality systems and technical competence and formally recognize compliance by issuing a certificate of accreditation. ISO/IEC 17025 is the international standard used to accredit testing and calibration laboratories for measured quantities. Accredited calibrations can be required by regulating bodies or to comply with a company's quality standards. For example, accredited calibration may be required for instruments used as reference standards or to meet various demands from different authorities.



Vancouver, Canada	Boston, USA	São Paulo, Brazil	Helsinki, Finland	Beijing, China	Tokyo, Japan
STANDARD CALIBRATION SERVICES					
Relative Humidity	Relative Humidity	Relative Humidity	Relative Humidity	Relative Humidity	Relative Humidity
Temperature	Temperature	Temperature	Temperature		Temperature
	Dew Point	Dew Point	Dew Point	Dew Point	Dew Point
	Barometric Pressure	Barometric Pressure	Barometric Pressure	Barometric Pressure	Barometric Pressure
	Carbon Dioxide	Carbon Dioxide	Carbon Dioxide	Carbon Dioxide	Carbon Dioxide
DC Voltage & Current					
ACCREDITED CALIBRATION SERVICES					
				ISO9001 Standard Calibrations	
Relative Humidity	Relative Humidity	Relative Humidity	Relative Humidity		Relative Humidity
Temperature	Temperature	Temperature	Temperature		
	Dew Point				Dew Point
	Barometric Pressure	Barometric Pressure	Barometric Pressure		

Vaisala Filters

Group A: 12 mm Diameter, Standard Length, Female Threads

0195
Brass, sintered filter, 133 microns, ø 12.0 mm
Use with: HMM100, HMP46
Group: A

0195

10159HM
Membrane filter, 0.2 microns, ø 12.0 mm
Use with: HMM100, HM34
Group: A

10159HM

6221
Plastic grid, 2 mm protection, ø 12.0 mm
Use with: HM34, HMM100
Group: A

6221

230727SP
Membrane filter, 0.2 microns, ø 12.0 mm
Use with: HMP155
Group: A

230727SP

Group B: 12 mm Diameter, Long Length, Female Threads (Could be used in place of "A" type filters)

DRW010276SP
PPS plastic grid filter, 6.5 mm, ø 12 mm
Use with: HMT330, HMT360, HMT310, HM70, PTU300
Group: B

DRW010276SP

HM47280SP
Stainless steel sintered filter, 38 µm, ø 12mm
Use with: HMT330, HMT360, HMT310, HM70, HMM100, DMT340, DMT242, DM70, PTU300
Group: B

HM47280SP

DRW010281SP
PPS plastic grid with stainless steel net, 15 µm, ø 12 mm
Use with: HMT330, HMT360, HMT310, HM70, PTU300
Group: B

DRW010281SP

HM47453SP
Stainless steel filter, 3.15 mm, ø 12 mm
Use with: MMT330, MMT310, MM70, HMT330, HMT360, HMT310, DMT340, PTU300
Group: B

HM47453SP

DRW212987SP
Sintered filter, 40 µm, ø 12 mm
Use with: HM70
Group: B

DRW212987SP

220752SP
Stainless steel filter for high oil flow (>1m/s) 2 mm hole size
Use with: MMT330, MMT310, MM70
Group: B

220752SP

220957SP
Stainless steel mesh filter, 18 µm, ø 12 mm
Use with: DMT152, DPT146
Group: B

220957SP

219452SP
Sintered PTFE filter, ø 12 mm
Use with: HMP155, HMM100, HMP63, HMP113
Group: B

219452SP

221494SP
Stainless steel filter for high oil flow (>1 m/s) 2 mm hole size
Use with: MMT162
Group: B

221494SP

225356SP
Stainless steel filter for oil measurements, ø 12 mm, 3 mm holes
Use with: MMT162
Group: B

225356SP

230602

230602
Tube filter
Use with: DMT132
Group: B

231865

231865
Vaporized Hydrogen Peroxide resistant sintered filter
Use with: HMT330, HMT360, HMT310, HM70, PTU300
Group: B

Group C: 12 mm Diameter, Male Threads

HM46670SP

HM46670SP
Sintered stainless steel filter, 38 µm, ø 12.0 mm
Use with: HMT120/130, HMD60/70, HMD42/53, HMP60, HMP110, HMM210
Group: C

DRW010525

DRW010525
Membrane filter, 0.2 µm, ø 12 mm
Use with: HMT120/130, HMP60, HMP110, HMD60/70, HMD42/53
Group: C

DRW010522

DRW010522
Plastic Grid, 2 mm, ø 12 mm
Use with: HMT120/130, HMD60/70, HMD42/53, HMP60, HMP110
Group: C

232637

232637
Vaporized Hydrogen Peroxide resistant sintered filter
Use with: HMT120/130, HMP110, HMP60
Group: C

Stand Alone - Not Interchangeable:

HM46780

HM46780
Stainless steel filter, 38 µm, ø 20 mm
Use with: DMT346 Cooling set

19858HM

19858HM
Membrane filter tube set (5 pcs)
Use with: HMP42

19867HM

19867HM
Steel grid for the HMP42,
1 mm, ø 4 mm

Filters for Discontinued Products

Group C: 12 mm Diameter, Male Threads

- 17039HM — Membrane filter, 0.2 µm, ø 12 mm

Group D: 13.5 mm Diameter, Male Threads

- 16452SP — Sintered filter, stainless steel, 37 microns, ø 13.5 mm
- 16562SP — PPS Grid, 2 mm, ø 13.5 mm
- 16720HMSP — PPS Grid and stainless steel net, 14 µm, ø 13.5 mm
- 17230HMSP — PTFE membrane, 3.5 µm, ø 13.5 mm
- HM46999SP — Sintered stainless steel filter, 2mm, ø 13.5

Group E: 18.5 mm Diameter, Female Threads

- 6597 — Plastic grid, 2.5 mm, ø 18.5 mm
- HM46717 — Plastic grid, 2.5 mm, ø 18.5 mm
- 2787HM — Membrane filter, 0.2 microns, ø 18.5 mm
- 16126HM — Metallized membrane filter, 0.5 µm, ø 18.5 mm